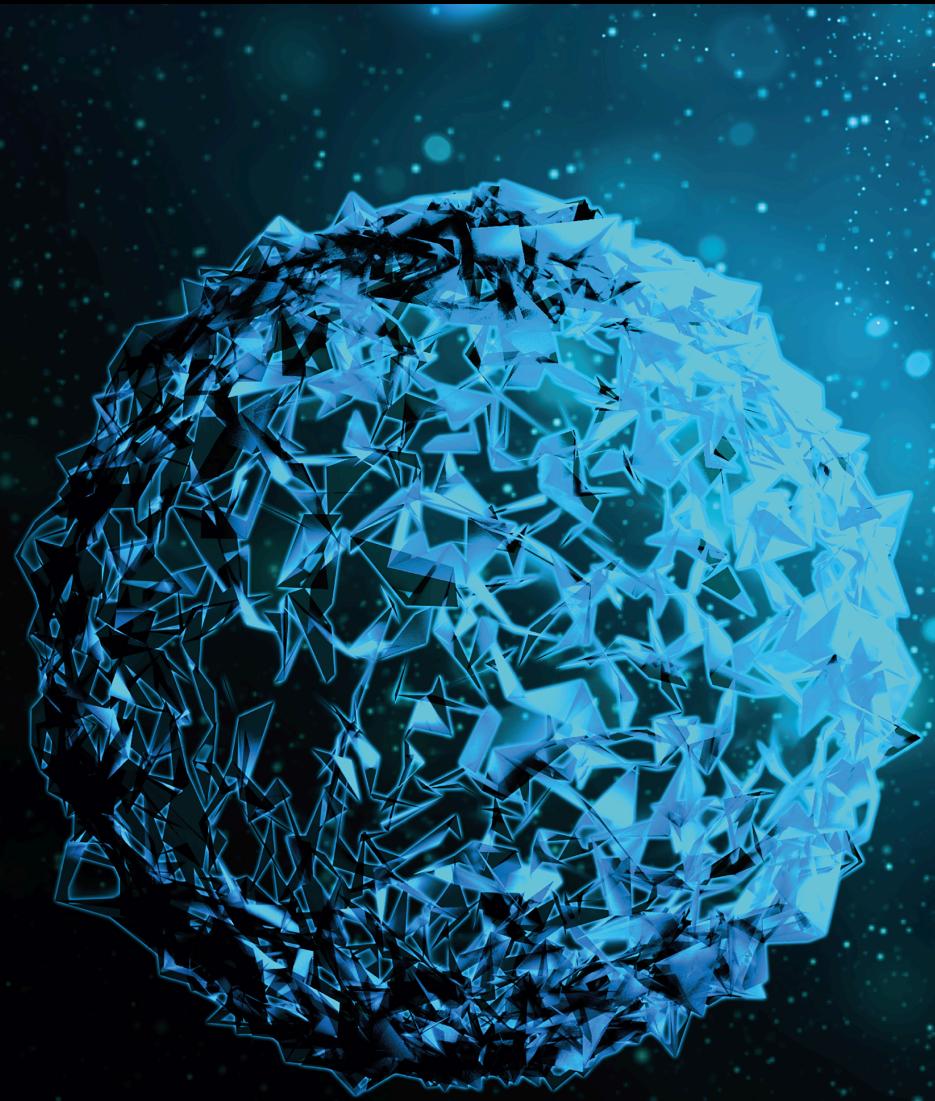


Addressing Risks: Mental Health, Work-Related Stress, and Occupational Disease Management to Enhance Well-Being 2019

Lead Guest Editor: Giorgi Gabriele

Guest Editors: Jose M. Leon-Perez, Silvia Pignata, Gabriela Topa, and Nicola Mucci



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Editorial

Addressing Risks: Mental Health, Work-Related Stress, and Occupational Disease Management to Enhance Well-Being 2019

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Biomed Research International, section Public Health, decided to transform the Special Issue “Addressing Risks: Mental Health, Work-Related Stress, and Occupational Disease Management to Enhance Well-Being” published in 2018 [1] into a permanent special issue.

The importance of a contextualized health approach with a focus on organizational environments is becoming more strategic than ever due to COVID-19 and the ensuing difficult situation that employees are experiencing worldwide. The prevention of workers’ mental health problems is complex and multidimensional, and it is not always possible to protect the person by analyzing personality, psychopathology, and psychiatric syndromes.

Accordingly, a peer review process involving international experts, with 21 papers accepted in this special issue, considered the important concept of work contextualized health. From this perspective, this special issue had the power to establish a dialogue between the multiple disciplines completing the majority of research on mental health constructs within clinical, neuroscientific, and psychiatric contexts, which usually led to a person-centered analysis or research conducted in artificial laboratory settings. As stated by Giorgi et al. [1], trauma and diseases related to stress and mental health that originate in the workplace may have a different pattern of development or require an organization-centered treatment approach, including field and intervention studies.

In addition, this special issue followed the United Nations agenda for developing 17 sustainable goals by 2030 [2] and tried to contribute to two of these goals: (1) promoting well-being at all ages, including mental health, and (2) promoting safe and secure working environments to create a decent work for all. In doing so, this special issue assumed that addressing such goals required an interdisciplinary approach involving scientific fields ranging from occupational medicine to organizational psychology.

Regarding the promotion of well-being at all ages, G. Giorgi et al. concluded in their narrative review that stress management strategies at work need to include “aging” as a crucial variable to tailor interventions and prevent workers’ cognitive impairment processes. Also, M. Ziarko et al. pointed out the necessity to consider the health and well-being of workers with chronic disease. In particular, their paper analyzed the mental health consequences of the type of treatment received by 85 participants affected by rheumatoid arthritis and confirmed the assumption that pain intensity, coping strategies, and ego resiliency depend on the severity of their levels of anxiety and depression.

Similarly, two papers emphasized the need to consider all agents involved in an organization, including students, as targets of safety and well-being measures. K. Gerreth et al. analyzed the anxiety of dental students during their first clinical class involving performing a prophylactic procedure in a

pediatric patient. Their results indicated that more than 51% of students reported high levels of anxiety. These findings emphasize the need for students to be trained to deal with stress as a part of their academic curriculum. In addition, K. Frömel et al. explored whether students reporting academic stressors differ in physical activity after school compared to those students that did not report being exposed to academic stressors. Although their hypotheses were not supported, it seems that gender should be taken into account when promoting physical activity to reduce stress: girls in the academic stressor group walked more (steps/hour measured with accelerometers) than girls in the nonacademic stressor group. Also, their study is a good example on how new devices such as accelerometers can be used to collect information in occupational health and safety research.

With regard to promoting safe and secure working environments to create a decent work for all, some papers published in this special issue introduce advances in measuring psychosocial risk factors, mental health, and work-related issues. For example, N. Tao et al. conducted a study in which they analyzed the relationship between occupational stress and secretory immunoglobulin A (sIgA) in a sample of 625 military recruits during their basic military training period. As expected, sIgA measured in saliva and quantified by enzyme-linked immunosorbent assay presented higher levels in the high occupational stress group than that in the low stress group. Furthermore, the salivary sIgA level was also associated with perceived personal strain.

Another work using innovative approaches to assess psychosocial risks and their consequences is the paper by J. R. López-García et al. They proposed using Bayesian networks to determine the probability of an occupational accident in a certain productive sector depending on the relationship between ergonomic and psychosocial factors. They used data from a national survey of working conditions in Spain ($n = 8,892$) to illustrate their approach. Their results suggest that ergonomic risks associated with physical strains and a lack of job satisfaction are associated with a higher probability of being involved in an occupational accident.

In contrast to these new approaches, traditional approaches to conduct psychosocial risk assessments are based on self-rated scales. In that sense, it is important to validate well-known scales to facilitate cross-cultural comparisons. This is the case of the study conducted by A. S. N. Isha et al. who validated the Copenhagen Psychosocial Work Environment Questionnaire (COPSOQ) in Malaysia. They also proposed the inclusion of physiological measures (blood pressure and body mass index) to monitor workers' health.

Similarly, V. Katsari et al. validated the Jefferson Scale of Patient Perception of Physician Empathy in Greece, which may be useful for monitoring both physicians' health and the quality of service that they provide. A noteworthy aspect of this study was the comparison between self-rated empathy and their patients' ratings. A similar approach was followed by I. Schneider et al. in their research on the degree of agreement between self-rated and observer-rated occupational psychosocial risks. They compared the ratings of workers and occupational safety and health committees to occupa-

tional psychosocial risks measured with the same instrument ($n = 669$). Their findings showed that observer ratings and self-ratings provided comparable results. Therefore, they concluded that (a) the observer rating approach is especially suitable for small-to-medium enterprises that do not have access to a large anonymous survey assessment and (b) aggregation of item means at the group level is justified because their results showed a reasonable agreement and excellent reliability in workers' self-ratings, and therefore, the self-rating approach can be very useful for large enterprises.

Another way to improve existing scales to measure psychosocial risks at work is to add relevant dimensions that are associated with employees' health and well-being. In that sense, the work by K. Kowalcuk et al. attempted to identify the most arduous and frequently occurring burdens in nursing workplaces. They found that ward type predicted the level of work arduousness beyond other factors such as age or gender, suggesting that trauma and diseases related to stress and mental health that originate in the workplace may have a different pattern of development or require an organization-centered treatment approach that complements the person-centered approach derived from research conducted in clinical and psychiatric contexts.

In a similar vein, M. Martini et al. highlighted the importance of including both demands and support derived from interactions with students when conducting psychosocial risk assessments in higher education. With a sample of 550 professors from a large public university, their results revealed that relationships with students can play a crucial role in how academics experience emotional exhaustion and engagement at work. Also, findings from the study conducted by M. del Mar Molero Jurado et al. in the education sector reaffirm that burnout is a pivotal psychosocial risk that requires prevention within the sector. They proposed that measures to prevent burnout need to consider the educational context when implementing preventative actions both at the individual (i.e., increasing self-efficacy) and organizational level (i.e., improving the education system). Moreover, organizational level measures should include the promotion of healthy behaviors as emphasized by research on public health initiatives to prevent noncommunicable diseases [3]. This is clearly exemplified in the study by A. Habib et al. who analyzed the risk factors of noncommunicable diseases in a sample from Saudi Arabia ($N = 1,070$). Their findings revealed the need to promote healthy behaviors as a suitable public health strategy to reduce noncommunicable diseases such as cardiovascular disease or diabetes.

In addition to these potential measures to promote health and well-being, the literature has indicated that active coping and recovery from work are crucial to avoid stress-related problems [4, 5]. In that sense, the paper by Y. Hsu et al. reported that working more hours was associated with higher levels of occupational stress, which was related to lower levels of work-family balance and job satisfaction. They found that perceived control over time plays a protective role because it was associated with increased recovery-related self-efficacy. In addition, a focus on coping strategies by X. Wang et al. revealed that

depressive symptoms in military institutions is a matter that needs to be considered, as they found that the relationship between coping (i.e., hardiness) and depressive symptoms is mediated by motivational dispositions.

Addressing psychosocial risks and introducing preventive measures at work are equally important as identifying who is exposed to the risks and what are the potential negative consequences on employees' health and well-being. First, A. Przystanska et al. explored the psychosocial predictors of bruxism. They concluded that perceived stress is a crucial somatic factor in the occurrence and maintenance of awake bruxism. Second, K. Golonka et al. went beyond the usual negative effects of burnout and explored potential brain activity differences between burned-out and nonburned workers (control group). Their results suggest that participants in the burnout group showed cortical hyperactivity, which results in reduced alpha power compared to participants in the control group. Finally, T. Mitake et al. analyzed the stigma related to mental illness in the workplace, such as the psychological consequences derived from burnout. This relationship is important to examine because being stigmatized at work due to mental illness can result in experiencing discriminative behaviors.

Following the abovementioned findings, another factor that deserves special attention to create a decent work for all is the promotion of working environments free from discrimination and violence, including sexual and psychological violence (i.e., sexual harassment or workplace bullying). The paper by S. A. Jahnke et al. addressed the prevalence of chronic work discrimination and the harassment of women firefighters ($n = 1,773$) and its psychosocial consequences. Their results revealed that a considerable percentage of women firefighters reported that they had experienced verbal harassment (37.5%) and unwanted sexual advances (37.4%) in their fire service work. Furthermore, this discrimination and harassment at work were related to increased alcohol consumption and mental health problems, including depressive symptoms, anxiety, and posttraumatic stress symptoms. Similarly, S. Berlanda et al. analyzed the experiences of violence (emotional, physical, and sexual) perpetrated by patients and visitors against healthcare professionals working in emergency units. They found that greater age and higher scores in secure attachment are associated with reduced experience of emotional violence from patients and visitors, and the relationship between secure attachment and the amount of patient-and-visitor-perpetrated emotional violence experienced is mediated by levels of job satisfaction.

Finally, with regard to the ongoing situation and the economic crisis caused by the COVID-19 pandemic, employee welfare and social support may not be the current priorities for companies as they attempt to maintain their survival by staff layoffs and budget reductions [6, 7]. Moreover, studies have shown that turbulent economic periods, in which job uncertainty is the norm, create a fertile soil for the increase of violence at work and stress-related mental health problems [6, 8]. In this regard, S. De Sio et al. studied the role of job insecurity in the perception of psychosocial risks at work in a sample of 338 administrative technical workers and found that workers with temporary contracts perceived higher

exposure to psychosocial risks at work than their colleagues with permanent contracts.

The contributions to this special issue highlight the essential need to consider organizational practices and culture in the management of mental health problems linked to the workplace as organizational causes are often more harmful than individual antecedents. Raising awareness of the organization's intervention politics, of organization-worker health relationships at work, and of an organizational science of mental health appears necessary. Overall, the manuscripts included in this special issue reported the perspectives of 123 authors, reflecting a valuable cross-cultural point of view on health prevention and promotion.

In conclusion, we would like to share a reflection on what we have seen during the COVID-19 pandemic as workers' mental health still represents a point of fragility of the systems-countries, where an overly medicalized and pathologizing model of mental health risks hiding not only organizational causes and responsibilities creating an image of stigmatized workers but also hiding potential and successful organizational interventions in prevention, safety, and health areas. There is therefore a disharmonious relationship between business and health while, as strongly supported by the Business@Health laboratory of the European University of Roma, there is no business without employee health, and in the same way, employee health becomes business.

Conflicts of Interest

The editors declare that they have no conflicts of interest regarding the publication of this special issue.

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Silvia Pignata
Gabriela Topa
Nicola Mucci

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Corrigendum

Corrigendum to “Comparability of Self-Ratings and Observer Ratings in Occupational Psychosocial Risk Assessments: Is There Agreement?”

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In the article titled “Comparability of Self-Ratings and Observer Ratings in Occupational Psychosocial Risk Assessments: Is There Agreement?” [1], References [5, 8] should be removed since they were recommended during the review process and do not contribute essentially to the topic.

The references to be removed are as follows:

[5] N. Mucci, G. Giorgi, M. Roncaiolli, J. F. Perez, and G. Arcangeli, “The correlation between stress and economic crisis: a systematic review,” *Neuropsychiatric Disease and Treatment*, vol. 12, pp. 983–993, 2016.

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This finding is particularly alarming because employees more frequently report psychosocial risks and strain during times of economic recession [6]. For instance, insomnia ratings were greater among nurses who experienced a pay cut than among nurses whose payment conditions had not changed [7]. If supervisors were trained in interactional justice (i.e., an intervention aimed at improving psychosocial working conditions), the degree of insomnia and thus the individual strain response decreased faster than those for nurses whose supervisors did not receive a training. Thus, the assessment of psychosocial risks during crisis time appears to be a strategic topic [6].

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Research Article

Analysis of Occupational Stress and Its Relationship with Secretory Immunoglobulin A in the Xinjiang Plateau Young Military Recruits

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Background. With the continuous improvement of the modernization of the Chinese military and the major adjustments made by the state to the recruitment policy, the newly recruited military undergone multiple pressures such as targeted high-intensity military training and environmental changes. The mental health of military has become a crucial factor of improving the fighting capacity effectiveness of the troops. **Objectives.** To explore occupational stress of young recruits in the Xinjiang plateau environment during their basic military training period and analyze the relationship between occupational stress and secretory immunoglobulin A (sIgA) levels. **Methods.** Using multistage stratified cluster random sampling, 625 recruits stationed at Xinjiang plateau command in 2014 were enrolled as subjects. Occupational stress was assessed by the Occupational Stress Inventory Revised Edition (OSI-R). sIgA in saliva was quantified by enzyme-linked immunosorbent assay. The resulting data were analyzed using descriptive statistics, nonparametric tests, and correlation analysis. **Results.** Based on demographic characteristics, occupational stress was higher in the urban group than the rural group, coping ability for stress was greater in individuals who were students before joining the army than nonstudents, occupational stress was higher in smokers than nonsmokers, and coping ability for stress was higher in nonsmokers than in smokers (all $P < 0.05$). Being an only child, educational level and age were not significantly related to occupational stress scores ($P > 0.05$). Salivary sIgA level was higher in the high occupational stress group than in the low stress group ($P < 0.01$). Salivary sIgA was positively correlated with scores on the occupational role and personal strain questionnaires ($r_s = 0.229$, $r_s = 0.268$, $P < 0.01$). **Conclusion.** Demographic characteristics influenced occupational stress among young recruits in cold and high-altitude area. Further, there were some relationships between occupational stress and salivary sIgA in young military recruits.

1. Introduction

The Xinjiang plateau military region, the frontier of China's western strategic direction, is the entire territory of the Xinjiang Uygur Autonomous Region and the Ali area of the Tibet Autonomous Region. The garrison area bordering nine countries is >1.9 million km², and its border line

is $>6,000$ km long. The garrison is widely located in the plateau, desert, and snow mountains. It has the highest altitude of 5,300 m above sea level. In addition, it has the "Shenxian Bay" post, the lowest grassroots company in the Turpan Basin, which is the lowest in the winter, the "Hongshanzi" frontier guard company with extremely cold winter, and the "Huozhou" combat troops with hot

summer temperatures reaching 47°C in summer. The main characteristics of the environment of the Xinjiang plateau are cold climate, gradual temperature decrease with increase in altitude, low oxygen content, and strong ultraviolet radiation. This harsh natural environment along with arduous combat tasks has a potential impact on the physical and mental health of soldiers.

Since the financial crisis in 2008, many countries have suffered from severe economic recession and there has been an employment problem. Under the special background of the lingering after effects of the economic crisis, more and more young people are under pressure from various factors such as family economy, employment, and higher education [1]. In 2009, China made a major adjustment to the conscription policy and recruited young people with higher education enrollment, which provided a new direction to solve the problems of employment [2]. Different from other countries (such as South Korea), China adopted the conscription system that combines conscription with volunteer military service [3]. The implementation of the new military service law has included the college students who were originally listed as deferred enlistment in the range of enlistment, which makes more and more college students and graduates to enlist as a new choice for employment problem.

The military is a special occupational setting that often involves dangerous, emergency, and mandatory tasks. Military employees are considered to be a group with great physical and mental health damage [4]. In an army environment that advocates courage, tenacity, and not fearing difficulties, the mental health of soldiers can be easily neglected to some extent. Soldiers need to maintain high combat effectiveness, which is a special professional characteristic along with a strong tension and stimulation. Military training, special military operation, environment, and actual combat experience greatly influence soldiers' mental health.

At present, men and women who have reached the age of 18 up to 23 can be enlisted for active service according to the needs of the armed forces and on a voluntary basis [5]. Most of the Chinese military's enlisted age is around 18 years or so, the rapid development stage of the body, mind, and self-consciousness makes majority of young people choose to go to college, leaving only a few who choose to join the army at the high school or university stage. The training period of the new recruits is the beginning of their military career, the main workload of which is strict training and assessment. With the continuous improvement of the modernization of the Chinese military, the requirements for the military's quality are also constantly increasing. Massive environmental impact, strict discipline constraints, high intensity military training, and remaining competitive within the various military forces, young military forces around the world young military recruits often end up having high levels of stress. High occupational stress has an important impact on their physical and mental health [6].

Psychological scales, a general survey method, are commonly used to evaluate occupational stress at present [7, 8]. In addition to being closely related to psychological indicators, occupational stress is related to changes in physiological indicators [9], in the systematic view of bodily function,

human physiology, and psychology interact. As an important barrier against infection in the upper respiratory tract, salivary secretory immunoglobulin A (sIgA) can be used as a marker of the overall state of the immune system [10]. However, the relationship between psychological stress and level of salivary sIgA at home and abroad are inconsistent [11, 12].

However, the relationship between recruits' occupational stress and saliva sIgA has not previously been reported in the Xinjiang plateau environment. Therefore, by investigating newly enlisted soldiers in the Xinjiang army in 2014, the present study aimed to combine noninvasive physiological indicators and the occupational stress scale to better understand occupational stress during the training period.

2. Object and Method

2.1. Objects. Adopting a multistage stratified random sampling method, 625 recruits from a military unit in the Xinjiang plateau military region were selected in October 2014. The inclusion criteria were (1) new recruits enrolled in September 2014 and (2) completion of medical examinations before and after enlistment conducted according to the Chinese people's liberation army physical examination standards to exclude any psychological or physiological diseases affecting service. All subjects were aware of the purpose and possible consequences of the study. The participants received no financial reward. This study was approved by the Medical Ethics Committee of Xinjiang Medical University and all participants provided written informed consent.

2.2. Method

2.2.1. Demographic Characteristics Survey. An ad hoc questionnaire was used to collect personal information including date of birth, educational level, current smoking status, residence, and job before enlistment.

2.2.2. Occupational Stress Survey. Occupational stress was assessed using the Occupational Stress Inventory Revised Edition (OSI-R) [13]. This instrument comprises three subscales: Occupational Role Questionnaire (ORQ), Personal Strain Questionnaire (PSQ), and Personal Resources Questionnaire (PRQ). ORQ assesses role overload, role insufficiency, role ambiguity, role boundary, responsibility (R), and physical environment. PSQ assesses vocational strain, psychological strain (PSY), interpersonal strain, and physical strain (PHS). PRQ assesses recreation (RE), self-care, social support (SS), and rational/cognitive ability. Each subitem contains 10 items, resulting in a total of 140 items. Responses were recorded using a 5-point Likert scale. The higher the scores on the occupational task and stress response questionnaires, the higher was the degree of stress; the higher the scores on the coping resources questionnaires, the stronger was the ability to cope with stress [14]. As recruit training is essentially a form of "work," it is reasonable to use OSI-R to measure stress during this time. The reliability (Cronbach's coefficient) of the ORQ, PSQ, and PRQ subscales of OSI-R were 0.722, 0.857, and 0.816, respectively, indicating good reliability.

2.2.3. Saliva Samples. Subjects were instructed to not consume any food or drink before sample collection. The subjects sat quietly, tilted their heads forward, and opened their mouths slightly. Saliva was secreted naturally and collected in a sterile sampling cup. Sample volumes ranged from 2 to 5 ml [15, 16]. After collection, saliva samples were centrifuged (3500 RPM × 5 min) and frozen at -86°C until analysis.

2.2.4. Quantification of Salivary sIgA. Salivary sIgA was quantified using the human sIgA enzyme-linked immunosorbent assay (ELISA) kit following the manufacturer's instructions (Shanghai Jianglai Biological Co., Ltd., batch number 201412). Other instruments used include a Bio-Rad microplate reader, pipette (Dalong Medical Equipment Co., Ltd.), electrothermal thermostatic incubator (Shanghai Jinghong Experimental Equipment Co., Ltd.), and microoscillator (Jintan Medical Instrument Factory). The absorbance of the control, samples, and blank were measured at 450 nm wavelength using a microplate reader. The detection limit of sIgA was 1.5 µg/ml.

2.3. Quality Control. The experimenters fully explained the purpose of the study, answered any questions, emphasized the anonymous nature of the study, obtained subjects' trust, confirmed voluntary participation, provided accurate information, administered the questionnaire on the spot, and then collected the completed questionnaire.

Saliva was collected after the questionnaire was completed and the saliva sample number corresponded to the questionnaire number. After the experiment, all data were recorded using the EpiData 3.1 software. Two independent investigators verified the accuracy of data entry.

2.4. Statistical Analysis. Statistical analysis was performed using the SPSS 16.0 software. First, a normality test was performed. For a nonnormal distribution, data were described by the median (M) as well as the 25th and 75th percentiles (P_{25}, P_{75}), and Mann-Whitney U test was used to analyze differences in occupational stress between demographic groups. Based on ORQ, PSQ, and PRQ scores, subjects were divided into high and low stress groups: subjects with scores greater than or equal to the mean score were assigned to the high subgroup, while with scores below the mean were assigned to the low subgroup [17]. The relationship between occupational stress and salivary sIgA content was analyzed by the Mann-Whitney U test. Spearman's correlation coefficient was used to analyze the relationship between occupational stress and salivary sIgA content. The level of statistical significance was set at $P = 0.05$ for a two-tailed test.

3. Results

3.1. Participant Characteristics. Of the total 625 questionnaires distributed, 623 were recovered. Some questionnaires were excluded because of incomplete information or logical errors, resulting in 597 (95.5%) questionnaires used for analysis. The subjects were all unmarried males with an average age of 18.75 ± 1.34 . Of the participants, 152 (25.46%) were from urban areas, 445 (74.54%) were from rural areas, 121 (20.27%) were an only child, 507 (84.92%) had an education

level below senior high school, 90 (15.08%) had an education level above junior college, 346 (57.96%) were students before enlistment, 251 (42.73%) were not students before enlisting, 189 (31.66%) were current smokers, and 461 (77.22%) were younger than 20 (Table 1).

3.2. Relationship between Demographic Characteristics and Occupational Stress. The median (P_{25}, P_{75}) ORQ score was 115.00 (99.00, 130.50) with a range of 67.00–188.0. The median (P_{25}, P_{75}) PSQ score was 71.00 (59.00, 87.00) with a range of 41.00–151.00. The median (P_{25}, P_{75}) was 140.00 (125.00, 155.00) with a range of 71.00–196.00. The ORQ and PSQ scores of the urban group were higher than those of the rural group; the PRQ scores of individuals who were students before enlistment were higher than those of nonstudents; and the ORQ and PSQ scores smokers were higher than those of nonsmokers, while PRQ scores of nonsmokers were lower than those of nonsmokers (all $P < 0.05$). There was no significant difference in OSI-R subscale scores among new recruits related to being only children, educational level, or age (all $P > 0.05$). These results are summarized in Table 1.

3.3. Comparison of Different Occupational Stress Levels and Saliva sIgA Levels. The median (P_{25}, P_{75}) salivary sIgA level was 14.11 (10.46–18.29) µg/ml. The comparison of sIgA levels between high and low OSI-R subscale groups showed that the sIgA content in the saliva of high-scoring ORQ and PSQ groups was higher than that of low-scoring groups, and the difference was significant ($P < 0.01$), while the PRQ level and salivary sIgA content changed; however, there was no significant difference ($P > 0.05$), as shown in Table 2.

3.4. Correlation between Occupational Stress and Salivary sIgA Content. Spearman's correlation analysis showed that salivary sIgA content was weakly positively correlated with ORQ and PSQ scores ($P < 0.01$), but there was no significant correlation with PRQ scores ($P > 0.05$), as shown in Table 3.

4. Discussions

Soldiers stationed in the high and cold area of the Xinjiang plateau have to deal with this special ecological environment all year long, which makes them suffer from higher occupational stress. Under occupational stress for a long time, their physical and mental health status are not optimistic. Enlistment is an important stage of one's career. New recruits must break away from the established lifestyle and social relations, enter a new professional environment, and face a new job. The relatively closed, arduous, and tense training life in the army is stressful for many young soldiers who have just stepped into the barracks [18].

Our survey results showed that in the Xinjiang plateau, occupational stress was higher in the new recruits in the urban group than in the rural group; the coping ability of individuals who were students before enlistment was higher than that of nonstudents; the occupational stress level of smokers was higher than that of nonsmokers; and the coping ability of smokers was lower than that of nonsmokers. Thus, demographic characteristics have different effects on occupational stress among new recruits. There are several possible

TABLE 1: Influence of demographic characteristics on occupational stress ($n = 597$).

Group	Number	Proportion	ORQ	PSQ	PRQ
Registered residence					
Urban	152	25.46	117.00 (100.00, 137.75)	75.50 (60.00, 95.00)	137.00 (121.25, 154.00)
Rural	445	74.54	114.00 (98.00, 129.00)	69.00 (58.00, 84.00)	140.00 (125.50, 156.00)
Z_1			-1.998	-2.133	-1.358
P_1			0.046	0.033	0.175
Single child					
Yes	121	20.27	116.00 (98.25, 133.00)	73.00 (60.00, 87.75)	140.50 (125.25, 154.00)
No	476	79.73	114.00 (99.00, 130.00)	70.00 (58.00, 87.00)	139.50 (125.00, 156.00)
Z_2			-0.331	-1.104	-0.236
P_2			0.741	0.269	0.814
Education level					
High school or above	507	84.92	115.00 (99.00, 131.00)	71.00 (59.00, 88.00)	139.00 (124.00, 155.00)
College or above	90	15.08	116.00 (97.75, 129.25)	69.50 (57.00, 83.25)	141.00 (130.00, 157.00)
Z_3			-0.44	-0.43	-1.115
P_3			0.66	0.667	0.265
Social status before enlisting					
Student	346	57.96	114.00 (99.00, 130.25)	69.00 (57.00, 86.00)	142.00 (126.75, 157.00)
Not student	251	42.04	116.00 (98.00, 131.00)	73.00 (60.00, 89.00)	137.00 (123.00, 151.00)
Z_4			-0.558	-1.705	-2.323
P_4			0.577	0.088	0.02
Smoker					
Yes	189	31.66	119.00 (100.00, 134.00)	73.00 (61.00, 94.50)	137.00 (120.00, 152.00)
No	408	68.34	113.00 (98.00, 129.00)	69.00 (58.00, 84.00)	141.00 (126.00, 157.00)
Z_5			-2.096	-2.782	-2.379
P_5			0.036	0.005	0.017
Age					
≥ 20	136	22.78	114.00 (99.00, 129.00)	71.00 (58.50, 86.50)	140.00 (125.00, 156.00)
< 20	461	77.22	120.00 (98.00, 136.75)	69.00 (59.00, 90.50)	138.00 (124.00, 154.00)
Z_6			-1.445	-0.147	-0.791
P_6			0.148	0.883	0.429

The values of Z_1 and P_1 were the results of comparing occupational tasks, stress response, and coping resources scores among groups with different family locations; the values of Z_2 and P_2 were the results of comparing occupational tasks, stress response, and coping resources scores among groups with different family sizes; the values of Z_3 and P_3 were the results of comparing occupational tasks, stress response, and coping resources scores among groups with different educational levels; the values of Z_4 and P_4 were the results of comparing occupational task, stress response, and coping resource scores among different preenlistment status groups; the values Z_5 and P_5 were the results of comparing occupational task, stress response, and coping resource scores between smoking and nonsmoking groups; and the values Z_6 and P_6 were the results of comparing occupational task, stress response, and coping resource scores among different age groups.

reasons for this: (1) residence: people from an urban environment feel more pressure because of the faster pace of urban life compared to life in rural China. In addition, because of the greater development of urban infrastructure, recruits from the city who enter the military camp might feel more discomfort, leading to a higher level of occupational stress. (2) Identity before enlisting: due to formal education in schools, interpersonal relationships, and motivation, students may have a better sense of obedience after enlistment and adapt to the tense and regimented life of the army quickly, and thus cope better with occupational stress. By contrast, working or unemployed groups have relatively

complex contacts, different experiences, and diverse motivations for enlistment. Their perspectives and positions may affect their ability to cope with occupational stress. (3) Smoking: an unhealthy lifestyle, such as smoking, in the army is a noteworthy phenomenon. Foreign military surveys show that the proportion of mental health disorders among tobacco-dependent populations is higher [19]. This study also suggests that smoking may be associated with occupational stress.

At present, occupational stress scales and related questionnaires are typically used to evaluate occupational stress [20, 21]. There are few studies on occupational stress that include physiological indicators. Although psychological

TABLE 2: Comparison of salivary sIgA and occupational stress.

Group	Number	Proportion (%)	Salivary sIgA ($M (P_{25}, P_{75}) (\mu\text{g/ml})$)	Z	P
Occupational role				-4.027	0.001
Low	314	52.6	12.40 (11.38-18.29)		
High	283	47.4	15.32 (11.67-19.55)		
Personal strain				-3.263	0.001
Low	353	59.13	12.28 (8.69-15.04)		
High	244	40.87	14.65 (10.94-18.99)		
Personal resources				-1.879	0.060
	296	49.58	14.75 (11.38-18.29)		
	301	50.42	13.05 (9.96-18.14)		

TABLE 3: Correlation of occupational stress and salivary sIgA (Spearman's correlation coefficient).

Occupational stress subscale	Salivary sIgA level ($\mu\text{g/ml}$)	r_s	P
ORQ	0.229	0.001	
PSQ	0.268	0.001	
PRQ	-0.124	0.054	

scales are commonly used to evaluate occupational stress, it is undeniable that the results are greatly influenced by subjective factors. Occupational stress, besides being closely associated with the human psychology indicator, is related to human physiological indicators involving the hypothalamus-pituitary-adrenal axis [22], immune system [23], etc. Therefore, it is appropriate to combine physiological indicators with questionnaires to study occupational stress. Various objective physiological indicators have been used to assess occupational stress by scholars in China and abroad, typically using blood samples. However, collecting blood may be an additional stressor; therefore, it may be a confounding factor that could influence the outcome of the experiment. Further, the amount of blood collected is limited, and it is not possible to collect blood for a long time. By contrast, saliva is easy to collect, noninvasive, and has high cost-effectiveness, which has aroused great research interest.

Saliva sIgA plays an important role in local anti-infection, which is closely related to the immune function of the body. According to the results of the present study, in the Xinjiang plateau military region, the high degree of occupational stress of the recruits is associated with an increase in saliva sIgA levels. This shows that the body's immune function is associated with occupational stress. This is likely to be the case of the young soldiers in boot training who start a new career. Because of the tremendous changes in the environment, the body's immune function is affected. This can easily cause bacterial and viral infections. This leads to an increase in sIgA synthesis and secretion in the oral mucosa. In addition, the results suggest that the short-term increase in sIgA synthesis

may be an "alert" signal for the body to adapt to occupational stress. Several studies have suggested different changing trends in psychological stress and human sIgA content. Long-term chronic psychological stress can lead to decreased salivary sIgA content [12], whereas acute stress leads to increased salivary sIgA content [24], consistent with the findings of the present study.

This study preliminarily analyzed the relationship between the Xinjiang plateau military region recruits' occupational stress and sIgA content in saliva, which has some limitations. Firstly, cross-sectional epidemiological research methods cannot determine an exact causal relationship or an exact correlation mechanism; rather, it can only provide clues for further cohort studies. Secondly, all respondents were unmarried males aged 20 or so in Xinjiang, China, and no females were included. These demographic characteristics are quite different from those of the general population. Thirdly, occupational stress was assessed by the OSI-R and saliva sIgA was quantified by ELISA, which had no clinical diagnostic value. Lastly, it was impossible to analyze dynamic changes in occupational stress and sIgA content because saliva was collected at a single time point.

Despite these shortcomings, this study helps deepen the understanding of the relationship between the Xinjiang plateau military region recruits' occupational stress and physiological indicators. Due to its reliability and the simplicity of sample collection, storage, and analysis, further study of the relationship between salivary sIgA and occupational stress in soldiers is warranted.

5. Conclusion

The cold climate, gradual temperature decrease with increase in altitude, low oxygen content, strong ultraviolet radiation of the Xinjiang plateau, and arduous combat tasks have a potential impact on the physical and mental health of soldiers. Environmental changes along with discipline and restrictions have an impact on occupational stress level after enlistment of the soldiers. Salivary sIgA is positively correlated with occupational role and personal strain. Thus, salivary sIgA can be used to explore occupational stress.

Data Availability

The (SAV) data used to support the funding of this study are restricted in order to protect the participant privacy. Data are available from Jiwen Liu (liujiwen@xjmu.edu.cn) for researchers who meet the criteria for access to confidential data.

Conflicts of Interest

The authors declare no conflicts of interest.

Authors' Contributions

N.T., H.A., and J.Z. are assigned on the design; X.L. and Y.Z. did the investigation; X.L. and H.A are assigned on the data curation; J.Z. and Y.Z. are assigned on formal analysis; N.T. wrote the original draft preparation; X.X. and J.W. wrote the review and did the editing; X.X. is assigned on supervising; J.W. is assigned on project administration. All authors contributed to the interpretation of the result, revised the manuscript critically, and approved the final version of the manuscript. Ning Tao, Hengqing An, Jianjiang Zhang, and Yuanyue Zhang contributed equally to this work.

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Research Article

Academic Stress and Physical Activity in Adolescents

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The issue of work-related mental health needs to be addressed at the school level. The aim of this study was to explore the associations between academic stress (AS) of adolescent boys and girls and their physical activity (PA) during recesses and after school and to propose measures to promote the adoption of lifelong healthy working habits. Adolescents from 16 schools in the Czech Republic and 6 schools in Poland participated in the study (187 boys and 339 girls). Monitoring of PA and cognitive stress was conducted during one school day. We used ActiTrainer accelerometers to monitor PA and physical inactivity. Data on time of PA and self-reported AS in school lessons were collected using recording sheets. We split the participants into two groups: those without a self-reported stressor and those who indicated one or more stressors. Differences in overall PA during recesses, as well as after-school PA, between boys with and without AS were not statistically significant for any PA characteristics. We observed similar results for girls. Repeated measures ANOVA confirmed that differences in PA (steps/hour) during recesses following particular lessons between participants with and without AS were not statistically significant in boys or girls ($F_{(4,1612)} = 1.83$, $p = 0.121$, $\eta_p^2 = 0.005$). It is noteworthy that girls with AS were statistically significantly more likely to meet the 6000 steps after school time recommendation (39%) than girls without AS (18%; $p < 0.001$). The study did not confirm the assumption that adolescents reporting AS have less PA during recesses or even after school than adolescents without AS. However, the overall low PA of adolescents during recesses and after school highlights the need to compensate for AS by adequate PA. This is especially true for adolescents with recurrent AS in several consecutive lessons.

1. Introduction

In the context of insufficient and declining levels of physical activity among adolescents [1, 2] and inadequate physical fitness [3, 4], the high cognitive and emotional load of adolescents in schools is negatively associated with their mental health (MH) [5]. Although some studies have not confirmed the association between physical activity (PA) decline and changes in MH in adolescents, this does not undermine the importance of studying these associations [6]. The prevalence of mental disorders in 12- to 17-year-olds in the USA has been increasing [7, 8], as is the case in Europe [9] and other countries [10]. In addition, while the prevalence of mental disorders is generally high, there exists significant inequality in MH among young people [11].

Mental disorders occur more frequently in younger than older individuals [12]. Thus, such disorders will often occur in lower levels of school. Mental health and behavioral problems in childhood predict similar problems in adolescence [13]. Half of all mental health problems in adulthood are manifested in adolescence or before [9]. In schools in the United Kingdom [14], Germany [15], and other countries, the deterioration of pupils' MH is a current challenge, consistent with The Lancet Commission's call to urgently address this undesirable trend [16]. It is possible that the education system, school environment, and education system itself have a deleterious effect on the mental health of pupils.

Academic stress (AS) is a serious issue [17]. We consider AS in line with Selye's [18] understanding of this term as an individual's nonspecific set of responses to internal or

external stimuli intervening with the habitual academic process. AS is a topic of interest also because it needs to be considered in relation to future work-related stress. AS can be understood analogically to work-related stress. It is mostly acceptable to define work-related stress “as a negative psychological state with cognitive and emotional components with effects on the health of both individual employees and their organizations” ([19]: 12). Psychosocial, environmental, safety, organizational, and other aspects of work-related stress are of the same importance when addressing the issues of AS in the school environment.

The severity of the negative impact of AS is probably the most critical in Asian countries [20]. Despite this, Zhao et al. [21] note that reformation of the Chinese education system, which aimed to reduce academic stress, has not yet been effective. These researchers highlighted the importance of raising the level of education in both China and the United States; however, with respect to global economic competition, the issue also concerns sustaining a humanistic approach to learning. Yoo [22] expresses similar concerns about the psychosocial development of South Korean adolescents, on the basis of the finding that bonding social capital is a causal predictor of AS. At the same time, he indicated that it is necessary to consider that the effect of bonding social capital on AS may be either negative or positive.

Criticism of deteriorating MH in schools must be viewed in the context of state, school, and health policies, with cooperation between school authorities, school management, teachers, parents, representatives of municipalities, leisure-time educators, and other staff involved in education. Cross-national cooperation of schools across Europe is therefore very important, given the complexity of addressing MH issues in schools [23]. This is especially so because other factors interfere with the MH of children and youth. These factors not only relate to physical health, demographics, and environment but also concern socioeconomic or ethnic factors, individual personality traits, and other public-health aspects. Gender differences play an important role in adolescents’ MH in school [24], particularly with respect to mental resilience. However, there is limited evidence regarding the longer-term effects of interventions that aim to increase mental resilience [25]. For these and other—particularly developmental—reasons, the issue of the children’s and youth’s MH is more complicated than physical health regarding diagnostics and treatment of symptoms, and more difficult in adulthood. At the same time, it is clear that the period of school attendance, and hence the role of the school, is critical in preventing MH issues in children and youth [26].

Evidence of the effectiveness of interventions into MH crises in schools is very limited [27]. Greater effectiveness is likely following the promotion of MH literacy, as shown by Millin et al. [28], who demonstrated the effectiveness of MH literacy among high school students. However, there is a lack of peer-reviewed literature explaining the importance of MH literacy for MH enhancement [29].

Little is known about the associations between the physical and mental conditions of the younger generation.

However, their mutual dependence is clear. In particular, cardiorespiratory fitness can be an important indicator of health, including mental health, in children and youth [30]. PA is also effective in improving self-esteem and reducing depression, but it does not affect anxiety scores [31]. It has also been shown that vigorous PA, cardiorespiratory fitness, and BMI are associated with adolescents’ mental well-being and quality of life [32]. Improved physical fitness in adolescence may be associated with fewer symptoms of depression [33] or may reduce their social physique anxiety [34]. Physical inactivity associated with stress might also be detrimental to adolescents’ physical health, including increasing the risk of injuries [35]. Together with other risk and organizational factors, this amplifies cardiovascular risk in the workplace [36] as well as in schools.

School policy, curricula, and educational processes are unable to respond to changes in the lifestyle of children and youth which is confirmed by the requirements for reforms in education systems among European countries [37]. A school environment that meets the needs of children and youth should serve as the foundation of the future work environment. Therefore, significant competencies should include strategies to compensate mental load, such as PA coupled with mental relaxation.

Therefore, the aim of the current study was to explore the associations between academic stress of adolescent boys and girls and their physical activity during recesses and after school and to propose measures to promote the adoption of lifelong healthy working habits.

2. Methods

2.1. Participants. The research was carried out between 2015 and 2016 in sixteen schools in the Czech Republic and six schools in Poland. Due to the complexity of PA monitoring, schools were selected on the basis of extant long-term research collaboration. Overall, 187 boys (36 Polish boys) and 339 girls (51 Polish girls) met the criteria to participate in the study (Table 1). In this sample, we analyzed 1122 school lessons and recesses that met the criteria for PA monitoring (boys without AS, $n = 244$, and with AS, $n = 95$; girls without AS, $n = 547$, and with AS, $n = 236$). Given the similarities in the types of schools, the organization of the teaching process (the same duration of lessons and recesses), and the sampling of participants, we did not include the factor of the country in the analyses. For individual analysis of lessons (congruent in Czech and Polish schools) and recesses, we chose six participants who self-reported AS in four or more lessons. Those were the only participants who indicated AS in four or more lessons and showed a high heart rate ($\geq 60\%$ HRmax - minutes), while being physically inactive. The selected participants represent an extremely stressed group with the highest health risk.

2.2. Assessment of Physical Activity. For PA monitoring, we used the ActiTrainer™ accelerometer (Florida, USA; <http://www.theactigraph.com/products/actitrainer>), which measures PA (counts) and heart rate (HR). As part of the initial

TABLE 1: Sample characteristics.

Gender	<i>n</i>	Age (years)		Weight (kg)		Height (cm)		BMI ($\text{kg}\cdot\text{m}^{-2}$)		HRrest (beats $\cdot\text{min}^{-1}$)		Steps/day (number)	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Boys	187	16.43	1.17	70.33	12.42	178.40	7.90	22.04	3.30	60.53	6.04	9373	4172
Girls	339	16.39	1.17	59.39	9.54	167.71	6.78	21.11	3.14	63.08	6.66	8955	3370

M: mean; SD: standard deviation; BMI: body mass index; HRrest: resting heart rate.

training, the participants registered in the web application (<http://www.indares.com>). During registration, the participants provided basic data about themselves, of which we used information on age, weight and height, country, day of monitoring in the week, size of the place of residence, ownership of a dog in their family, and participation in organized PA. The training covered exploration of the Indares features, how to wear the accelerometer, measurement of resting heart rate (HRrest), and supplementary recordings (course of the day, records of PA duration and type).

Immediately after waking in the morning, the participants measured their HRrest three times for 15 seconds and noted their beats per minute. The resulting HRrest was calculated as the mean of the three measured values and then controlled using the lowest daily HR value recorded by the ActiTrainer device. HR measurements were cross-checked using a Polar S610iT™ heart rate monitor upon participants' arrival in school. The participants launched the actual PA monitoring the next morning (after morning hygiene) and wore the accelerometer throughout the day (except for bathing and swimming) until going to bed. This routine was the same in the next two days. We included the first day with complete and flawless PA and HR records in the analyses (Monday: 19 days; Tuesday: 61 days; Wednesday: 42 days; Thursday: 53 days; and Friday: 32 days).

During the day, the participants recorded the times of events before school, at school in accordance with the schedule of lessons and recesses, and after school. In the evening, after the end of the monitoring day, they wrote down the type and duration of all types of physical activity and inactivity (lasting at least 10 minutes) carried out during the day. These data were used only to verify the objective data obtained from the accelerometers.

To process the accelerometer data (15-second epoch), we used the custom software IntPA13 (https://upol.cz/fileadmin/userdata/FTK/Fakulta/Verejnosc/Navod_IntPA13.pdf), which is only available in the Czech language. The program is able to assess the duration of PA and physical inactivity in specific school-day segments. PA intensity was determined using HR data, which was expressed in 10% intervals between 30% and 100% of HRmax (for boys, HRmax = 220 - age and for girls, HRmax = 226 - age) and in MET units as positive integers. Intensity zones were divided into low (50–59.9% HRmax; <3 METs), moderate (60–84.9% HRmax; 3–5.9 METs), and vigorous PA (85–100% HRmax; ≥6 METs). In this study, we present results concerning moderate-to-vigorous PA (MVPA) intensity (60–100% HRmax, ≥3 METs). The accelerometer data were processed consistent with previously published methods [38–41].

Only the participants who provided a valid record of at least three lessons in school, at least 120 minutes of after-school time, and at least 480 monitoring minutes throughout the day were included in the analyses. The number of physical education lessons was similar in both groups of participants (25% without AS and 28% with AS). We excluded 89 participants who fail to meet these criteria.

After the research was complete, all participants received individual feedback on their PA and physical inactivity, caloric expenditure, HR, and step count. The feedback contained information on PA intensity in METs and HR zones, together with simple line graphs presenting daily caloric expenditure and HR [41]. School management received aggregate anonymized results of the entire study sample.

2.3. Record of Time Segments and Stressors in Lessons. After the end of each lesson, the participants provided a self-assessment regarding excessive (greater than habitual) AS experienced during the course of the lesson. The term AS was explained and defined to the participants as negative stress (distress) during an initial session with them. The major stressors in lessons were represented only by external negative factors (oral examination, written tests, time-demanding schoolwork, overall work overload, negative actions of a teacher or student, the inadequate difficulty of organization or cooperation, and other academic tasks exceeding the adaptive capacities of the participants). If it occurred, self-assessed negative stress was reported in recording sheets next to particular lessons (clearly defined types of lessons: mathematics, geography, foreign language, etc.) using the "S" mark. Participants also provided verbalized (written) explanations of AS, particularly the main causes of the self-reported individual AS. These stress records were then counter-checked with the heart rate records. Objectively measured heart rate was higher than the resting heart rate, with participants being physically inactive, in all lessons marked with "S." According to the stress records, we split the participants into a group that did not record AS in any lesson (without AS) and a group with AS at least one lesson (with AS).

2.4. Statistical Analysis. Statistica version 13 (StatSoft, Prague, Czech Republic) and SPSS version 22 (IBM Corp., Armonk, NY) were used for statistical analyses. First, we computed basic descriptive statistics. Next, we used the Kruskal-Wallis test to analyze differences in aggregate PA of different groups of participants, repeated measures ANOVA to assess differences in PA on individual days, and

contingency tables to assess differences in compliance with PA recommendations. Finally, binary logistic regression with the standard enter method (all independent variables are entered into the equation at the same time) was used to assess the odds of meeting after-school PA recommendations. The η^2 and η_p^2 effect size coefficients were evaluated as follows: $0.01 \leq \eta^2 < 0.06$ was considered a small effect size, $0.06 \leq \eta^2 < 0.14$ was considered a medium effect size, and $\eta^2 \geq 0.14$ was considered a large effect size.

2.5. Ethics. The management of each school, all participants, and their parents received information about the objectives and course of the research, in respect of the fact that they provided written informed consent. These persons were informed of the provision of the individual feedback on the participants' individual results and that anonymity would be preserved in the aggregate group results and future publication of the overall research results. The Indares web application conforms with the requirements of the General Data Protection Regulation (EU 2016/679). The study was approved by the Institutional Research Ethics Committee of the Palacký University of Olomouc (decision no. 24/2012).

3. Results

3.1. Analysis of Differences in Boys' and Girls' PA between Those with and without AS. Differences in the overall PA between boys, as well as girls, with and without AS were not statistically significant for any of the PA characteristics (Table 2). Only differences in the overall PA during recesses were statistically significant, when we compared boys and girls with AS. Girls with AS reached $30.6 \text{ min}\cdot\text{hour}^{-1}$ of PA during recesses in contrast to boys who reached $37.0 \text{ min}\cdot\text{hour}^{-1}$.

Additionally, none of the differences in after-school PA among boys, as well as girls, with or without AS were statistically significant for any of the PA characteristics (Table 3). Differences in steps/hour and MVPA (≥ 3 METs) were statistically significant between boys and girls with AS.

Repeated measures ANOVA confirmed that the differences in PA (steps/hour) during recesses between the participants with and without AS were not statistically significant in boys or girls ($F_{(4,1612)} = 1.83$, $p = 0.121$, $\eta_p^2 = 0.005$). Only differences between boys and girls reporting AS were statistically significant, with boys being more physically active ($F_{(4,1612)} = 2.87$, $p = 0.022$, $\eta_p^2 = 0.007$). The most pronounced differences were found during the second recesses (usually 20 minutes long), in which boys without AS reached 546 ± 769 steps/hour (girls 367 ± 467 steps/hour), whereas boys who reported AS reached 540 steps/hour (girls 374 ± 420 steps/hour).

3.2. Meeting PA Recommendations in Boys and Girls with and without AS. A significantly higher number of girls with AS met the after-school PA recommendation (39%) than girls without AS (18%; $p < 0.001$, Figure 1). In contrast, a larger proportion of girls without AS (37%) met the

recommendation for PA in school (3000 steps/school time) than girls experiencing AS (27%), but the difference was not statistically significant despite reaching practical significance. Concerning the 11,000 steps/day recommendation, we did not observe statistically significant differences between the groups with and without AS.

The association between AS and compliance with the recommendation of 6000 steps after school time was also confirmed by the results of the binary logistic regression, in both girls and boys (Table 4). The odds of meeting the 6000 steps after school time recommendation in boys and girls with AS was not significantly influenced by age, BMI, participation in organized PA, country, day of the week, size of the place of residence, or dog ownership. Meeting of the 6000 steps/after-school time was primarily associated with boys' participation in organized PA ($p = 0.025$).

3.3. Individual Evaluation of Participants Reporting AS in Four or More Lessons (Group with the Highest Health Risk). The HRmax achieved in the lessons and subsequent recesses highlights the high level of mental stress in six participants who reported AS in four or more lessons (Figure 2); while being physically inactive, we detected high HR that was confirmed by self-reported AS. HR recorded in recesses showed apparent gradual fading of mental stress after the lesson; however, PA (steps/hour) of these most "stressed" adolescents was similar to that of the other participants (Figure 3). Overall, PA and MVPA accounted for 55.4% and 12.3% of the total recess time, respectively, in the most "stressed" participants (54.7% and 7.5% in the entire sample).

3.4. Self-Assessment of AS in Lessons. Out of 526 days of PA monitoring, participants reported self-assessed AS beyond that habitually experienced during the course of lessons on 207 days. The main causes of AS in lessons were written tests and exams (61.4%), oral examinations (16.9%), and demanding lesson content (10.6%). A small proportion (10.1%) of participants also reported fear, especially of the teacher. We did not find any statistically significant differences in individual types of stressors between boys and girls ($p = 0.678$).

4. Discussion

The primary finding of this study is that participants who reported AS in lessons did not have lower levels of PA during recesses or after school. Given the overall low PA of adolescents during recesses [38, 41], this finding highlights the major challenge of raising PA during recesses among all adolescents. Previous studies often note the presence of insufficient PA during recesses [42] and interventions aimed at increasing PA during recesses have been generally unsuccessful [43]. Most studies also indicate the failure of students to comply with the recommendation that PA should account for at least 50% of recess break [38]. In our study, PA during recesses represented 36.1% of recess time in boys and 31.0% in girls. This is consistent with our earlier

TABLE 2: Overall physical activity during recesses of adolescents with and without academic stress.

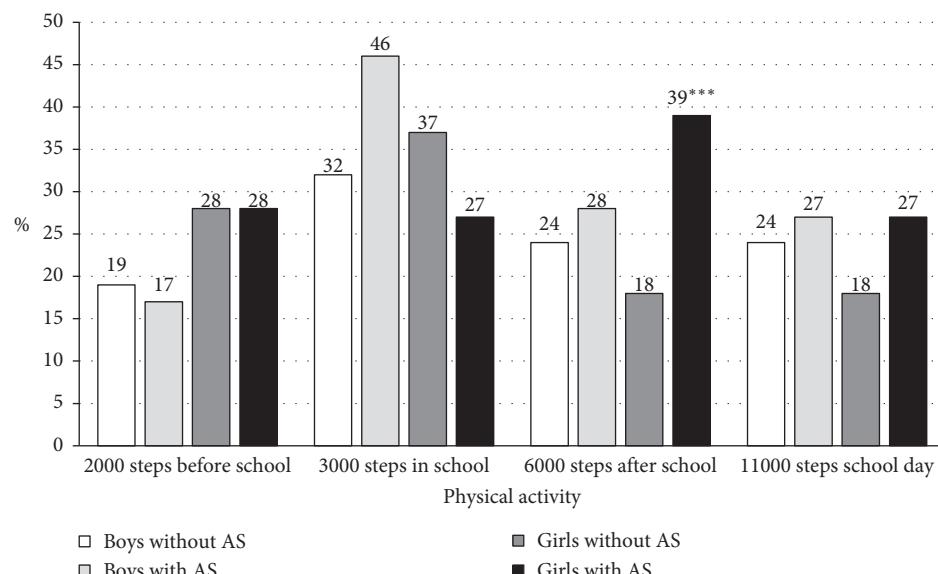
PA characteristics	Boys				Girls				<i>H</i>	<i>p</i>	η^2			
	Without AS (n = 244)		With AS (n = 95)		Without AS (n = 547)		With AS (n = 236)							
	Mdn	IQR	Mdn	IQR	Mdn	IQR	Mdn	IQR						
Physical activity (min·hour ⁻¹)	34.57	15.98	37.01	14.24	31.06	11.47	30.60	11.40	34.54 ^a	<0.001	0.066**			
Steps·hour ⁻¹ (number)	1081	581	1160	861	961	554	936	470	18.23	<0.001	0.035*			
MVPA ≥ 3 METs (min·hour ⁻¹)	4.20	4.95	5.08	5.96	3.00	4.06	3.30	3.83	26.55	<0.001	0.051*			
MVPA ≥ 60% HRmax (min)	0.50	4.43	1.50	7.39	1.12	5.31	1.64	5.40	2.30	0.513	0.004			

AS: academic stress; MVPA: moderate-to-vigorous physical activity; Mdn: median values; IQR: interquartile range; *H*: Kruskal-Wallis test; η^2 : Cohen's effect size; *p*: significance level; η^2 : * $0.01 \leq \eta^2 < 0.06$ small effect size; ** $0.06 \leq \eta^2 < 0.14$ medium effect size; ^a: significant difference between groups (boys versus girls with AS).

TABLE 3: Overall after-school physical activity in adolescents with and without academic stress.

PA characteristics	Boys				Girls				<i>H</i>	<i>p</i>	η^2			
	Without AS (n = 244)		With AS (n = 95)		Without AS (n = 547)		With AS (n = 236)							
	Mdn	IQR	Mdn	IQR	Mdn	IQR	Mdn	IQR						
Physical activity (min·hour ⁻¹)	22.91	14.96	22.12	13.28	24.22	9.98	24.28	11.15	3.63	0.304	0.007			
Steps·hour ⁻¹ (number)	601	603	716	613	670	549	814	530	14.76 ^d	0.002	0.028*			
MVPA ≥ 3 METs (min·hour ⁻¹)	3.38	4.33	4.22	4.29	3.00	3.90	4.35	4.23	15.36 ^d	0.002	0.029*			
MVPA ≥ 60% HRmax (min)	0.47	2.96	0.53	1.46	0.59	1.53	0.65	1.98	3.23	0.357	0.006			

AS: academic stress; MVPA: moderate-to-vigorous physical activity; Mdn: median values; IQR: interquartile ranges; *H*: Kruskal-Wallis test; η^2 : Cohen's effect size; *p*: significance level; η^2 : * $0.01 \leq \eta^2 < 0.06$ small effect size; ** $0.06 \leq \eta^2 < 0.14$ medium effect size; ^d: significant difference between groups (boys versus girls with AS).

FIGURE 1: Proportions of boys ($n = 187$) and girls ($n = 339$) with and without academic stress (AS) who met the physical activity recommendations in school-day segments.

research, in which we found that PA accounted for 46.3% and 35.2% of the overall recess time in boys and girls, respectively [38], and with similar studies conducted in secondary schools [44]. A differentiated approach to adolescents' PA during recesses according to their individual level of AS is unlikely to be successful in the school environment. Promotion of PA during recesses, after cognitively demanding lessons, may be more effectively implemented by

involving school management and coordinating the educational program by teaching staff.

The crucial question is whether adolescents with recurrent AS should compensate for this mental load immediately after a lesson by a more intense but less time-demanding PA. Alternatively, such individuals could engage in more time-consuming forms of physically active recesses, as proposed by Pate et al. [45], i.e., at least once a day if a

TABLE 4: Meeting the 6000 steps after school time recommendation in boys and girls with or without academic stress (AS) in school.

Variables	Boys				Girls			
	Model 1		Model 2		Model 1		Model 2	
	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
<i>Academic stress</i>								
With AS ref.								
Without AS	0.795 (0.395–1.599)	0.519	0.609 (0.274–1.352)	0.223	2.934 (1.673–5.146)	<0.001	3.183 (1.734–5.815)	<0.001
<i>Age (years)</i>								
<16 ref.								
16			1.283 (0.551–2.987)	0.563			1.132 (0.641–1.999)	0.669
>16			0.844 (0.318–2.245)	0.735			0.952 (0.497–1.8225)	0.882
<i>BMI</i>								
≥25 kg m ⁻² ref.								
<25 kg m ⁻²			0.729 (0.275–1.930)	0.525			0.454 (0.206–1.001)	0.050
<i>Participation in organized PA</i>								
No ref.								
Yes			2.616 (1.127–6.074)	0.025			0.624 (0.367–1.061)	0.081
<i>Day of the week</i>								
Friday ref.								
Thursday			0.710 (0.259–1.945)	0.506			1.204 (0.608–2.384)	0.533
Wednesday			0.695 (0.196–2.459)	0.572			1.00 (0.462–2.168)	0.999
Tuesday			0.563 (0.180–1.756)	0.322			0.744 (0.328–1.689)	0.480
Monday			0.323 (0.089–1.728)	0.217			0.612 (0.236–1.587)	0.313
<i>Country</i>								
Czech rep. Ref.								
Poland			0.685 (0.227–2.063)	0.501			0.647 (0.290–1.444)	0.288
<i>Residence (population)</i>								
<1,000 ref.								
1,000–29,999			0.658 (0.265–1.636)	0.368			0.893 (0.495–1.612)	0.708
30,000–100,000			1.659 (0.560–4.915)	0.361			0.606 (0.293–1.255)	0.178
>100,000			0.836 (0.194–3.605)	0.810			0.452 (0.143–1.422)	0.174
<i>Dog ownership</i>								
No ref.								
Yes			1.115 (0.552–2.251)	0.765			0.919 (0.556–1.518)	0.742

Note. OR = odds ratio; CI = confidence interval; statistical significance of $p < 0.05$; Model 1 = academic stress; Model 2 = adjusted for age, BMI, participation in organized PA, day of the week, country, size of the place of residence, and dog ownership.

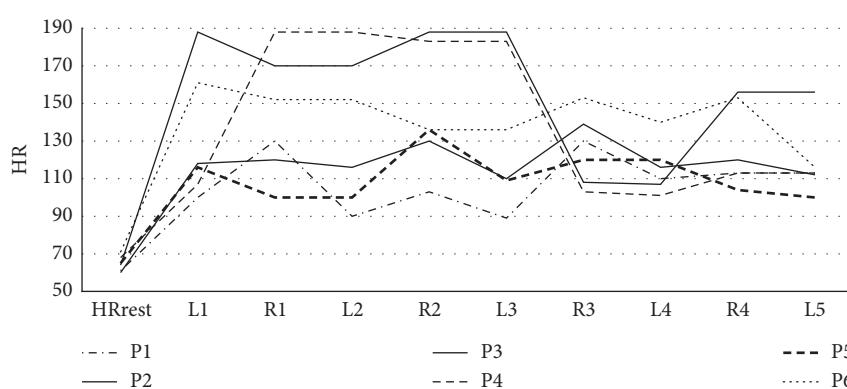


FIGURE 2: Maximum heart rate achieved in lessons (L1–L5) and subsequent recesses (R1–R4) in six participants (P1–P6) who reported academic stress in four or more lessons. HR: heart rate; HRrest: resting heart rate.

physical education lesson (PEL) is not scheduled. Our earlier finding that cumulative recess time exceeding 60 minutes cannot replace PELs regarding school PA is also important in this context [35]. However, the mental health benefits of short recesses remain very unclear compared to the health benefits arising from PELs.

There was statistically significantly lower PA among girls with AS than among boys reporting AS, as confirmed in selected PA characteristics during recesses but not in the after-school period. This does not contradict the recommendation to consider adolescent girls as an at-risk population that should be specifically supported by preventive

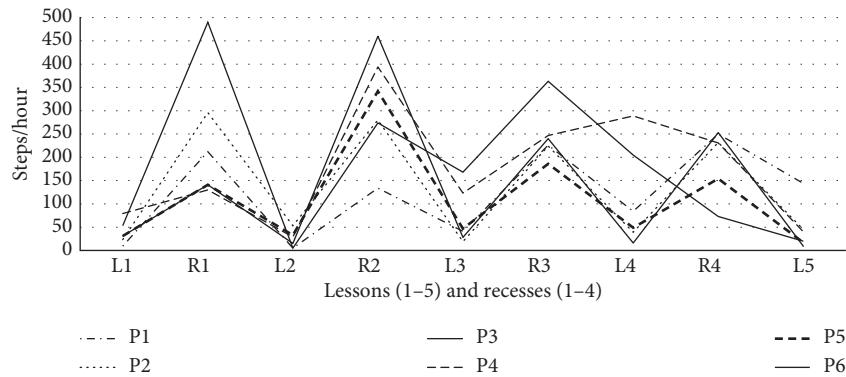


FIGURE 3: Mean number of steps per hour in lessons (L1–L5) and subsequent recesses (R1–R4) in six participants (P1–P6) who reported academic stress in four or more lessons. L: lesson; R: recess.

mental health care [46]. Numerous studies indicate that older children and especially girls have a relatively high level of depression [47]. For instance, in 14/15-year-old girls, Poulsen et al. [48] observed significant associations between low level of leisure-time PA and poor MH at the age of 20/21 years.

That adolescents with AS are not more physically active after school than adolescents without AS represents a warning. There is a need to seek ways to promote PA among adolescents at mental health risk. Muller-Riemenschneider et al. [49] drew attention to the importance of improving conditions for healthy forms of recreation for rural adolescents to avoid boredom and involvement in activities that may not be safe or healthy. Similarly, Dagkas and Stathi [50] emphasized the need for the better and wider provision of structured physical activity in schools in economically deprived areas to compensate for lower participation levels in organized leisure-time PA. The environment is of critical importance for adolescents' PA in school, recreation, active transportation, and household [51]. Considering the gender specifications, the results of the present study indicate that it is desirable to focus on analyses of the associations of boys' AS and their participation in various sorts of organized PA. In girls, attention should be paid to the associations among AS, participation in organized PA, and tendencies of overweight or obesity.

PA is associated with decreased concurrent depressive symptoms in children [52], but it has not been established whether PA is protective against depressive symptoms in adolescents [53]. Stress and depression have an adverse effect on the level of PA and physical fitness in children [54]. Moreover, Fedewa and Ahn [55] discovered the positive effects of PA and physical fitness on children's achievement and cognitive outcomes. In particular, cardiorespiratory fitness can be an important indicator of health, including its mental dimension, in children and youth [30]. However, numerous studies have indicated the positive effects of PA in patients manifesting anxiety symptoms [56]. Thus, the associations of lifestyle-related variables and anxiety and stress-related variables with diastolic pressure and cardiovascular health must also be considered when investigating AS at lower-stage schools [57]. We also believe that

adolescence and the time spent in school represent a "sensitive period" for the adoption of healthy work-related habits.

The individual responses of participants to recurring AS in four or more lessons were surprising. The most stress-responsive participants responded to AS with PA during recesses, although only at the level of the other study participants. From a physiological perspective, this was a rather insufficient response to mental load associated with high HR. Increased HR while physically inactive should be compensated for by increased HR during PA as suggested by Beijer et al. [58] who recommended high PA after prolonged television time with increased HR.

The PA of adolescents with AS should meet recommendations for specific segments of the day, i.e., recommendations regarding active transport to school, as well as PA at school, after school, and overall daily PA [38, 41]. Simplified recommendations of 60 min per day of PA every day [59, 60] or 11,000–14,000 steps per day [61, 62] are adequate for adolescents with AS. However, it is necessary to consider recommendations for moderate-to-vigorous PA, sedentary time, screen time, and sleep time [63].

As there are still no valid tools for measuring intrinsic, extraneous, and germane cognitive load [64], we chose the method of immediate self-assessment of MH immediately after the particular lesson, in order not to interfere with usual school conditions. During PA monitoring, cognitive stress assessment was a secondary task; therefore, an absolutely customary educational process took place for the participants in this study.

"Extraneous cognitive load is an element of interactivity that is caused by instructional factors and can be eliminated by altering instructional procedures" ([65]: 136). Associations between intrinsic and extraneous cognitive load are complex and therefore their clear distinction is not essential in educational practice. Most cognitive load effects, whether based on variations of intrinsic or extraneous cognitive load, may be explained using the common concept of elemental interactivity [65]. However, the identification of possible ways to eliminate undesirable stressors is essential in the educational process. According to the concept of van Merriënboer and Sweller [66], this concerns the transition

from overload under the influence of extraneous load to decreased extraneous load and consequently to optimized germane load.

Repeated stressful situations, which are predominately initiated by test and examination procedures, call for change in evaluation techniques and optimization of their frequency within a single school day or week. It is equally important to promote PA-oriented integrated educational activities in seasonal, semiannual, annual, and multiyear cycles (thematically integrated activities, project days, sports courses, etc.). Addressing the impact of recurrent AS on sleep quality [67], negative moods [68], and other unwanted physiological responses, emotional reactions, and harmful behaviors [69] is a challenge for future interdisciplinary research on the biological, social, and environmental factors of adolescent development.

Evidence-based prevention programs that promote adolescents' MH and positive changes in the school environment should be implemented in schools [15, 70]. Programs for adults working with youth with MS-related issues are of comparable importance [71]. Based on the positive results of the Adolescent Depression Awareness Program intervention, Beaudry et al. [72] suggest such types of school preventive programs to improve depression literacy. Future studies of adolescents' MH in school should verify which programs increase "academic stress literacy" within physical and health literacy.

4.1. Strengths and Limitations. All-day objective monitoring of PA volume and intensity, using internal (HR) and external responses (METs) of the adolescent, in the context of subjective assessment of AS represents the main strength of the present study. Despite attempts to preserve customary school conditions, and without interfering with the school program, some disruption was inevitable due to wearing of chest straps, recording of time segments of the day, and self-assessment of AS. Although self-reported AS was confirmed by higher HR while being physically inactive, it is impossible to clearly characterize this mental load as distress. More in-depth analyses of the self-assessment of AS and physiological responses to stress or increased heart rate during physical inactivity were beyond the scope of the present study. A less positive attitude of boys than girls towards meeting the monitoring criteria and a smaller number of Polish than Czech research participants are further limitations of the study. This hinders options and scope for more detailed gender and country comparisons.

5. Conclusions

The study did not confirm the hypothesis that adolescents reporting AS would be less physically active during recesses or even after school, compared with adolescents without AS. However, the overall low PA of adolescents during recesses and after school highlights the need to compensate for AS by adequate PA, in particular among adolescents with recurrent AS in several consecutive lessons. School management and teaching staff should respect varying cognitive loads

required by lesson content when preparing education programs. Programs should coordinate, restrict, or preferably use emotionally more acceptable forms of tests and exams, which are major causes of adolescents' AS. Recurring AS in consecutive lessons may lead to distress in adolescents, which may significantly contribute to worsening adolescents' MH. School management should ensure conditions that foster adolescents' PA during recesses, support the adoption of healthy habits to compensate for cognitive load during lessons, and promote AS literacy in adolescents. Along with parents, schools have the responsibility to promote in students the adoption of lifelong healthy working habits supportive of mental and physical health.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Acknowledgments

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Research Article

Physicians' Self-Assessed Empathy and Patients' Perceptions of Physicians' Empathy: Validation of the Greek Jefferson Scale of Patient Perception of Physician Empathy

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Aims. This study aims to (i) translate, culturally adapt, and validate the Jefferson Scale of Patient Perception of Physician Empathy questionnaire for the Greek population (Gr-JSPPPE) and (ii) estimate physicians' self-assessed empathy and patients' perceptions of physicians' empathy, investigate their relationship, and assess their predictors. **Methods.** A total of 189 patients and 17 physicians from an internal medicine clinic took part in the study. A composite questionnaire was administered to the patients, consisting of (1) sociodemographic items, (2) hospitalization-related questions, (3) the Zung Self-Rating Anxiety Scale, (4) the Patient Health Questionnaire (PHQ-9), (5) the EQ-5D-5L Questionnaire, (6) the Gr-JSPPPE, and (7) the Visual Analog Scale for pain. The physicians' composite questionnaire comprised (1) sociodemographic items, (2) the EQ-5D-5L questionnaire, and (3) the Toronto Composite Empathy Scale (TCES). Exploratory and confirmatory factor analyses were conducted to assess the psychometric properties of the Gr-JSPPPE. Univariate comparisons were performed between (a) empathy measures and (b) sociodemographic and health-related measures of both groups; multivariate regression analysis for the Gr-JSPPPE adjusting for baseline confounders was executed. **Results.** Statistically significant negative correlations were found between the Gr-JSPPPE mean score and the TCES personal/cognitive, professional/cognitive, and professional/emotional subscales. Female sex, being married, duration of employment in current post, and physicians' EQ-5D index score emerged as important predictors of increased physician empathy. Patients' EQ-VAS "thermometer" scale was significantly associated with the Gr-JSPPPE total score at the multivariate level. **Conclusion.** The Gr-JSPPPE is a psychometrically sound tool to assess patient perceptions of physician empathy. Physician empathy assessed by the self-reported scale is inversely associated with patient perceptions.

1. Introduction

Empathy is considered a prerequisite for a successful physician-patient relationship, an integral part of high-quality patient-centered healthcare, and is regarded as probably the most robust evidence of the humanitarian side of medicine [1–3]. Although the notion of empathy is not clearly and universally defined in the international literature [1, 2, 4–11], some of its key components can be unanimously recognized, namely, the physician's potential (a) to acknowledge the inner experiences as well as emotional state of the patient, (b) to communicate this acknowledgment to the patient, and (c) to adopt a positive and therapeutic behavior [12].

Empathic engagement in patient care seems to exert positive influences on both patients and physicians. It has been linked with decreased patient pain [13, 14] and anxiety [15], increased patient satisfaction [12, 16–23], increased adherence to treatment [18, 24], and improved clinical outcomes [12, 21, 24–30]. In addition, empathic physicians demonstrate a higher level of well-being [31–33], achieve higher ratings of clinical skills [34], suffer from lower levels of burnout [33], and are at decreased risk of medical malpractice [35–37]. Strikingly, through the adoption of patient-centered communication, physician empathy has even been associated with lower diagnostic test expenditures [38].

Physician empathy may be assessed either by (a) self-rating, denoting the completion of standardized

questionnaires by the physicians themselves, (b) patient-rating, signifying the assessment of physician empathy by their patients as experienced by them, and (c) third-person rating, indicating the evaluation of physician empathy towards their patients by an observer. A systematic review by Hemmerdinger et al. [39] identified a total of 36 instruments. Among 14 first-person assessments, only 6 of them had evidence of either reliability or internal consistency testing, whereas among 5-second person assessments, only the Consultation And Relational Empathy (CARE) scale demonstrated such evidence. Lately, evidence of validity and reliability for the Jefferson Scale of Patient Perception of Physician Empathy (JSPPPE), the shortest available instrument (5 items), was published [40]. This tool has attracted considerable notice and is now available in eleven languages [40].

Although it seems rational that the assessment of physician's empathy should also include the patients' perspective, to the author's knowledge, only four studies have explored the putative correlation between physicians' empathy as perceived by patients and as assessed by themselves, with the use of validated instruments [3, 41–43]. In all these studies, physicians and patients filled out the Jefferson Scale of Physician's Empathy (JSPE) and the JSPPPE, respectively. Further, in the most recent and largest study [43], the physicians additionally completed the International Reactivity Index scale and the patients were also administered the CARE scale. Interestingly, among these four studies, only one showed a positive and significant correlation [3]. As a result, the degree to which self-assessed empathy coincides with patients' views remains an open field. In addition, there is complete absence of any validated tool gathering patient feedback on physicians' empathy in the Greek literature.

The current study aims to (i) translate, culturally adapt, and validate the JSPPPE for the Greek population (Gr-JSPPPE) and (ii) estimate physicians' self-assessed empathy and its perception by patients, investigate their relationship, and assess their predictors.

2. Methods

2.1. Study Sample. The study was conducted from March to May 2018 at the Third Pathological Clinic of the “Papageorgiou” General Hospital in Thessaloniki, Greece. Its sample included two distinct groups. Group A consisted of all patients admitted to the clinic during the above period and group B comprised the patients' physicians. Patients with severe mental illness (dementia, aphasia, and uncontrolled psychosis) or experiencing any difficulty with the Greek language that would compromise their reading comprehension were excluded from the study.

2.2. Questionnaire Structure

2.2.1. Group A. The composite study questionnaire comprised the following:

- (1) Sociodemographic questions, i.e., age, sex, marital status, number of household members, education,

professional status (employed, unemployed, student, and housewife), and net personal monthly income.

- (2) Hospitalization-related questions including the length of stay and diagnosis, classified according to the Greek Diagnosis-Related Groups (DRGs).
- (3) The Zung Self-Rating Anxiety Scale (SAS), which is a 20-item self-rating tool assessing anxiety levels according to 4 symptom groups: cognitive, autonomic, motor, and central nervous system, such as “I feel more nervous and anxious than usual” (item 1). The answers, evaluating symptom frequency, are given on a 4-point Likert-type scale (“a little of the time,” “some of the time,” “good part of the time,” and “most of the time”). The total score range is 20 to 80; higher scores denote increased anxiety [44].
- (4) The Patient Health Questionnaire (PHQ-9), which is a 9-item self-administered tool using a 4-point Likert-type scale assessing the degree of depression according to symptom frequency (“not at all,” “several days,” “more than half the days,” and “nearly every day”), such as “little interest or pleasure in doing things” (item 1). The total score range is 0–27; a score of 10 has been suggested as a cutoff for the existence of depression [45].
- (5) The EQ-5D-5L questionnaire, which is a generic instrument measuring the quality of life by using 5 degrees of problem severity (none, slight, moderate, severe, and extreme) for each of the 5 dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression) [46]. According to patients' responses, the EQ-index values were calculated; the time trade-off (TTO) valuation technique using published scoring functions for the EQ-5D-3L was adopted [47]; the crosswalk link function was subsequently chosen to compute index values for the EQ-5D-5L [48]. In addition, EQ-5D comprises a visual analog scale for recording patients' assessment of their own health status on a 0–100 scale, named EQ-5D VAS “thermometer” [49].
- (6) The Jefferson Scale of Patient Perceptions of Physician Empathy (JSPPPE), which is a 5-item tool rating the patient's understanding of his/her physician's degree of empathic behavior. Every answer is recorded on a 7-point Likert-type scale (ranging from 1 = strongly disagree to 7 = strongly agree) [41, 42]. The scale score is generated by adding individual item scores; a higher score is correlated with a more empathic perception of the physician by the patient. Psychometrics of the original [40], a French [50], and a modified Spanish version [51] of the JSPPPE have been studied; evidence of validity and reliability for all versions has been documented.
- (7) The Visual Analog Scale (VAS) for pain, a unidimensional single-item scale assessing the patients' level of pain, consisting of a straight line with the endpoints denoting two extremes, i.e., “no pain” and “pain as bad as it could be” [52].

2.2.2. Group B. The composite study questionnaire consisted of

- (1) Sociodemographic questions, i.e., age, sex, marital status, number of household members, duration of employment in current post and total years of work experience, average duration of night sleep, and net personal monthly income.
- (2) The EQ-5D-5L questionnaire.
- (3) The Toronto Composite Empathy Scale (TCES), consisting of 52 questions evaluating empathy's cognitive as well as emotional aspects, in personal as well as professional settings, resulting in four subscales i.e., Personal Emotional (such as "I find it hard to *feel sorry* when they are having problems"), Professional Emotional (such as "I find it hard to *feel sorry for my patients* when they are having problems"), Personal Cognitive (such as "I try to understand *people better by imaging* how things look from their perspective"), and Professional Cognitive (such as "I try to understand *my patients better by imagining* how things look from their perspective"), each encompassing 13 questions [53]. Every question is answered on a 6-point Likert-type scale, according to the frequency of occurrence of thoughts and behaviors ("all of the time," "most of the time," "slightly more than half the time," "slightly less than half the time," "some of the time," and "at no time") [53]. Every subscale's score may vary between 13 and 78, with higher scores denoting increased empathy. The scale has been translated into Greek and has shown evidence of validity and reliability [54].

2.3. Translation and Cultural Adaptation of the JSPPPE. Written permission to translate the original JSPPPE version to Greek for research purposes was obtained from Kane et al. [41]. The translation procedure was in line with the guidelines concerning the cross-cultural adaptation of self-administered questionnaires [55].

The JSPPPE was initially translated into Greek by two independent experienced research and clinical physicians that were native Greek speakers with advanced knowledge of English (forward translation). A reconciliation meeting took place with the participation of a third independent reviewer, to create a consensus version (reconciled Greek version). Two bilingual physicians, who had no prior knowledge of the instrument, retranslated the reconciled version to the original language (back translation). The back translations were then compared and inconsistencies were addressed until consensus was reached regarding a final back translation document. This version was subsequently compared with the original English version of the JSPPPE, for final confirmation of the linguistic accuracy. In line with the usual cultural adaptation procedure, the instrument was handed over to five registered physicians to verify the clarity of each item, to ascertain its face validity. The last step consisted of sending the questionnaire to ten academics and health experts to highlight irrelevant, ambiguous, or problematic

items, therefore ensuring its content validity. No necessary modifications of the questionnaire emerged from these two final steps.

2.4. Questionnaire Administration. Patients were administered the paper-based composite questionnaire on the last day of their hospitalization by the researcher (AT), who was not involved in their treatment. Patients were reassured that their treating physician would remain blind to their responses and that their medical treatment would remain unaffected. The same researcher administered the composite questionnaire to the treating physicians. Anonymity and confidentiality were guaranteed for all participants.

The study was approved by the Institutional Review Board. Patients and physicians unanimously consented to participate in the study and gave their written informed consent. No compensation was provided to the participants.

2.5. Statistical Analysis. To begin, the study sample was randomly split into two halves. Exploratory factor analysis (EFA) was conducted on the first half for the creation of multi-item scales for the Gr-JSPPPE. Confirmatory factor analysis (CFA) was carried out in the second half to assess the model fit.

2.5.1. Exploratory Factor Analysis. Sample size exceeded the minimum 5:1 subjects-to-variable ratio adequate for EFA [56, 57]. The normality of the data was checked, as the multivariate normal distribution is a prerequisite for factor analysis. Although multivariate normality was violated, in the case of large samples, a good approximation of the normal distribution can be attained with the application of the multivariate Central Limit Theorem, therefore permitting the use of factor analysis [58]. Bartlett's test for sphericity was used to test the suitability of the variables for structure detection. The Kaiser-Meyer-Olkin test, measuring sampling adequacy for both individual model variables and the complete model, was also computed; a cutoff value of 0.5 is warranted for satisfactory results [59], with levels between 0.8 and 0.9 being regarded as great [60].

For the EFA, the principal axis factors method was used due to the assumption for multivariate normality being violated [61]. Two criteria were adopted to decide on the number of factors to retain: Kaiser's criterion, suggesting that only factors with eigenvalues higher than one must be retained, and the scree plot.

2.5.2. Confirmatory Factor Analysis. During CFA, the fit of the data to the model was evaluated. The Maximum Likelihood (ML) estimation method used in CFA is based on the multivariate normality assumption, which was found to be violated. In line with previous work [62], the Bootstrap Maximum Likelihood Estimator was adopted instead for estimating estimation standard errors and confidence intervals [63]. According to the suggestion by Nevitt and Hancock [64], the number of bootstrap samples was set at 250. The bias-corrected and accelerated bootstrap

confidence interval was set at the 95% level. Fit indices assessed included the following: (i) the Bollen–Stine bootstrap p statistic that was adopted instead of $\chi^2 p$, where appropriate [65]; a cutoff of $p > 0.05$ was regarded to designate adequate model fit, (ii) the Standardized Root Mean Square Residual (SRMR), whose values lower than 0.08 are deemed acceptable [58], (iii) the goodness-of-fit index (GFI) and adjusted goodness-of-fit index (AGFI), whose values of 0.95 and 0.90 indicate well-fitting models, respectively [66], (iv) the normed fit index (NFI), with values exceeding 0.95 being considered as a good fit [58], and (v) the Tucker Lewis Index (TLI) and the Comparative Fit Index (CFI); cutoff values of 0.90 and 0.95 correspond to acceptably and well-fitting models, respectively [67, 68]. The squared multiple correlations (R^2) were also computed for each measured model parameter [69]. The model fit was ameliorated by assessing modification indices (MIs) during the post hoc analyses [70].

2.5.3. Internal Consistency Reliability. Cronbach's alpha coefficient was adopted as an indicator of internal consistency. Other reliability statistics used were the range of interitem correlations, the corrected item-scale correlations, and Cronbach's alpha for a measure if a single item is deleted (corrected Cronbach's alpha).

2.5.4. Test-Retest Reliability. To compute test-retest reliability, 30 patients filled out the instruments twice, i.e., 24 hours after admission to the clinic and the last day of their hospitalization, provided that at least one week and no more than two weeks had elapsed. The sensitivity of the scale and its individual items to external factors was estimated by assessing test-retest reliability using intraclass correlation coefficients (ICC), which were computed using a two-way mixed-effects model [71, 72].

2.5.5. Ceiling and Floor Effects. Ceiling and floor effects were computed, whose presence weakens the scale's content validity; their existence indicates that several subjects' scores consistently cluster towards the best and worst level of scores, respectively.

Data were analyzed with IBM SPSS Statistics version 24 and IBM SPSS AMOS version 25 (Chicago, IL, USA). The mean (standard deviation) and median (interquartile range) were computed in the case continuous variables; absolute and relative frequencies (n ; %) were reported in the case of categorical variables. Interitem and item-scale correlations were calculated using Pearson's correlation coefficient (r). In group A, univariate analyses were performed to investigate associations between sociodemographic characteristics, health-related measures, and the Gr-JSPPPE. The parametric independent-samples T -test and Analysis of Variance (ANOVA) were used for evaluating differences between groups; Pearson's correlation coefficient (r) was employed to calculate the correlation between continuous variables and the Gr-JSPPPE. Predictors significant on univariate analyses were entered in the multivariate linear regression analysis. In

group B, univariate analyses were carried out to highlight associations between sociodemographic characteristics, health-related measures, and the TCES subscales. Due to small sample size, nonparametric tests were used, i.e., the Mann-Witney U test and the Kruskal-Wallis test to test the statistical significance of group differences and Spearman's correlation coefficient (r) to evaluate the strength and direction of association between continuous variables and the TCES subscales. The latter was also used to estimate the magnitude of association between the Gr-JSPPPE and TCES subscales. For the same reason, multivariate analyses were not undertaken in this group. The statistical significance level was set at $p < 0.05$.

3. Results

3.1. Exploratory Factor Analysis. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy ($KMO = 0.752$) and Bartlett's test of sphericity ($\chi^2(10) = 421.468, p < 0.001$) suggested that data were adequate for conducting an exploratory factor analysis. The factor analysis yielded only one factor, which explained 72.52% of the entire variance (Table 1).

3.2. Confirmatory Factor Analysis. A confirmatory factor analysis was performed to assess the extent to which the proposed 5-item scale fit the data. Unacceptable fit results emerged: Bollen–Stine bootstrap $p = 0.004$, SRMR = 0.057, GFI = 0.760, AGFI = 0.279, NFI = 0.845, TLI = 0.701, and CFI = 0.851. The deletion of the JS5 item with the lowest factor loading and a very high correlation with JS4 did not improve the fit results (data not shown). After examining the MIs, the error terms of JS4 and JS5 were covaried, resulting in a significantly improved model fit: Bollen–Stine bootstrap $p = 0.291$, SRMR = 0.020, GFI = 0.936, AGFI = 0.761, NFI = 0.968, TLI = 0.936, and CFI = 0.974 (Figure 1).

3.3. Internal Consistency Reliability. Cronbach's alpha coefficient for the Gr-JSPPPE scale was 0.935, denoting excellent internal consistency. The range of interitem correlations was 0.624–0.912; the only correlation above 0.85 was between JS4 and JS5. The corrected item-total correlations and the corrected Cronbach's alpha values if a single item is deleted are presented in Table 2.

3.4. Test-Retest Reliability. The test-retest reliability analysis provided excellent results, with all ICC values ranging between 0.848 and 0.958 (Table 3).

3.5. Ceiling and Floor Effects. In the case of ceiling effects, the percentages of observations corresponding to the best score category for the five items and the total Gr-JSPPPE score were 25.4%, 20.6%, 21.7%, 54.5%, 63.0%, and 14.3%, respectively. The percentages in the case of flooring effects were 3.2%, 7.4%, 6.9%, 2.6%, 1.1%, and 0.5%, respectively. Only the JS4 and JS5 items presented a considerable ceiling effect.

TABLE 1: Exploratory factor analysis.

Item code	Item description	Factor loadings	Communalities
JS1	Can view things from my perspective.	0.794	0.631
JS2	Asks about what is happening in my daily life.	0.863	0.745
JS3	Seems concerned about me and my family.	0.859	0.737
JS4	Understands my emotions, feelings, and concerns.	0.805	0.649
JS5	Is an understanding doctor.	0.718	0.515

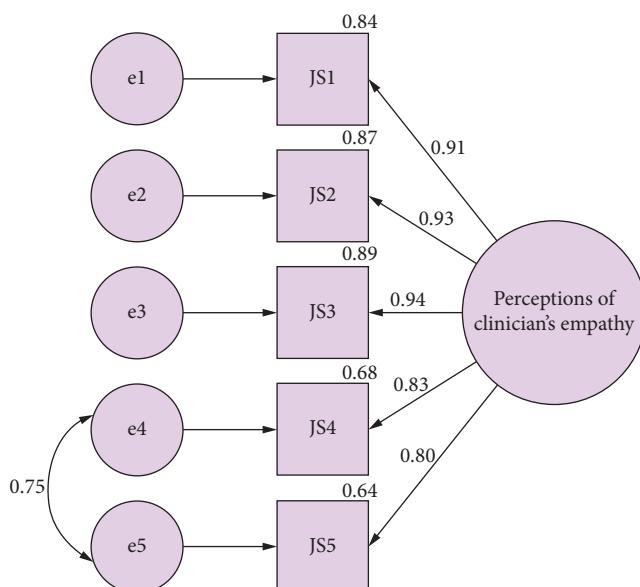


FIGURE 1: Path diagram for the confirmatory factor analysis with standardized regression estimates and squared multiple correlations.

TABLE 2: Median score values, interquartile ranges, corrected item-total correlations, and corrected Cronbach's alpha values.

Items	Median (IQR)	Item-total correlation*	Cronbach's alpha*
JS1	6 (3)	0.827	0.921
JS2	5 (3)	0.871	0.913
JS3	5 (3)	0.872	0.912
JS4	7 (2)	0.824	0.922
JS5	7 (1)	0.781	0.931

IQR = interquartile range. *If item deleted.

TABLE 3: Mean values and test-retest reliability using intraclass correlation coefficients.

Items	Test scores Mean (SD)	Retest scores Mean (SD)	ICC (95% CI)*
JS1	5.13 (1.82)	5.83 (1.49)	0.923 (0.846–0.963)**
JS2	4.71 (1.94)	5.30 (1.92)	0.949 (0.895–0.975)**
JS3	4.81 (1.91)	5.23 (2.27)	0.863 (0.732–0.932)**
JS4	5.92 (1.53)	6.17 (1.58)	0.900 (0.801–0.951)**
JS5	6.12 (1.41)	6.67 (0.80)	0.848 (0.705–0.925)**
Total	26.69 (7.74)	29.2 (7.03)	0.958 (0.914–0.980)**

ICC = intraclass correlation coefficients; CI = confidence interval; SD = standard deviation. *ICC values using a two-way mixed-effects model.

** $p < 0.001$.

3.6. Participants' Characteristics and Health-Related Measures. A total of 189 patients and 17 physicians completed the composite questionnaires; their sociodemographic characteristics are detailed in Table 4. The average duration of the patients' hospitalization was 5.7 (3.7) days. The commonest diagnoses for hospitalization, whose cumulative frequency exceeded 50%, were (a) infectious diseases ($n = 44$; 23.2%), (b) anemias ($n = 27$; 14.3%), (c) gastrointestinal hemorrhages ($n = 17$; 9.0%), and (d) strokes ($n = 16$; 8.4%). The scores of the Gr-JSPPPE are presented in Tables 2 and 3, according to which the JS4 and JS5 items showed the highest mean and median rank scores. The scores of the participants' other health-related measures are illustrated in Table 5.

Statistically significant negative correlations were found between the Gr-JSPPPE total score and the TCES personal/cognitive ($r = -0.244$, $p = 0.001$), professional/cognitive ($r = -0.225$, $p = 0.002$), and professional/emotional ($r = -0.174$, $p = 0.017$) subscales. However, the correlation between the Gr-JSPPPE total score and the TCES personal/emotional subscale was not statistically significant ($r = -0.118$, $p = 0.107$). The following correlations were revealed during the univariate analyses of TCES subscales with group's B sociodemographic and health-related measures subscales: (i) TCES personal/cognitive subscale was positively associated with female sex ($p = 0.046$) and being married ($p = 0.045$), (ii) TCES professional/cognitive subscale was positively associated with duration of employment in current post ($p = 0.025$) and marginally with female sex ($p = 0.059$), and (iii) TCES professional/emotional subscale was negatively associated with the physicians' EQ-5D index score ($p = 0.005$). At the multivariate level, only the group's A EQ-VAS "thermometer" scale demonstrated a significant association with the Gr-JSPPPE total score ($\beta = 0.043$, $p = 0.028$).

4. Discussion

In this study, the JSPPPE was translated and validated for the Greek population for the first time. During the exploratory factor analysis, a unidimensional scale emerged with high factor loadings, in line with previous work [40–51]. Furthermore, this is the first study to perform a confirmatory factor analysis on the 5-item 7-point Likert-type JSPPPE scale, as the only other available study used one 5-item version and one modified 6-item version of the instrument, both with a 5-point Likert-type answer scale [51]. In that study, the possible violation of the multivariate normality assumption along with the small degrees of freedom may have explained the inflated RMSEA for both instrument

TABLE 4: Sociodemographic characteristics of the study sample.

Categorical variables	Group A (n = 189) N (%)	Group B (n = 17) N (%)
Sex		
Males	100 (52.9)	8 (47.1)
Females	89 (47.1)	9 (52.9)
Marital status		
Single	23 (12.2)	9 (52.9)
Married/living with partner	117 (61.9)	7 (41.2)
Divorced	13 (6.9)	1 (5.9)
Widowed	36 (19.0)	0 (0.0)
Education		
Illiterate	44 (23.3)	n/a
Primary education	63 (33.3)	n/a
Secondary education	47 (24.9)	n/a
Technological educational institute	14 (7.4)	n/a
University	20 (10.6)	n/a
Postgraduate university education	1 (0.5)	n/a
Professional status		
Employed	33 (17.5)	n/a
Unemployed	16 (8.5)	n/a
Student	8 (4.2)	n/a
Housewife	132 (69.8)	n/a
Net personal monthly income		
0 Euros	30 (15.9)	n/a
1–500 Euros	97 (51.3)	n/a
501–1000 Euros	48 (25.4)	n/a
1001–1500 Euros	12 (6.3)	n/a
>1500 Euros	2 (1.1)	n/a
Duration of employment in current post		
0–2 years	n/a	11 (64.7)
3–5 years	n/a	5 (29.4)
6–9 years	n/a	0 (0.0)
10–14 years	n/a	1 (5.9)
≥15 years	n/a	0 (0.0)
Total years of work experience		
0–4 years	n/a	5 (29.4)
5–9 years	n/a	6 (35.3)
10–14 years	n/a	3 (17.6)
≥15 years	n/a	3 (17.6)
Average duration of night sleep		
≤ 5 hours	n/a	10 (58.8)
6–9 hours	n/a	7 (41.2)
≥10 hours	n/a	0 (0.0)
Continuous variables	Mean (SD); median (IQR)	
Age	66 (19.27); 72 (25)	36 (11); 33 (16)
Household members	2 (1.19); 2 (1)	2 (1.00); 2 (2)

SD = standard deviation; IQR = interquartile range; n/a = not applicable.

versions (0.098 and 0.158, respectively) [73]. For these reasons, we did not compute the chi-square *p* statistic and RMSEA index but decided to assess the Bollen–Stine bootstrap *p* instead.

In addition, this study highlighted some particularities of the JS4 and JS5 items previously undocumented; both exhibited a significant flooring effect, their interitem correlation was particularly high, and the confirmatory factor analysis model fit was significantly improved when their error terms were covaried. This may indicate that these two items may be measuring the same content of the construct;

additional studies are needed to replicate these findings. The current study is also the first to provide insight into the test-retest reliability of the JSPPPE tool; the considerably high values of all ICC coefficients denoted substantial test-retest reliability.

The most striking result to emerge from this study's data is that, except for the TCES personal/emotional subscale, significant negative correlations were revealed between all TCES subscales and the Gr-JSPPPE. To the authors' knowledge, this is the first study attempting to elucidate the association between these two scales. Importantly, this study

TABLE 5: Health-related measures.

Group A Scales	Mean score (SD)	Median score (IQR)
SAS	29.90 (6.07)	29 (6.5)
PHQ-9	4.37 (3.56)	4 (2)
EQ-5D index score	0.51 (0.35)	0.53 (0.53)
EQ-5D VAS “thermometer”	59.04 (28.49)	65 (50)
VAS pain scale	2.81 (2.92)	2 (6)
Group B Scales/subscales	Mean score (SD)	Median score (IQR)
EQ-5D index score	0.51 (0.35)	0.53 (0.53)
EQ-5D VAS “thermometer”	59.04 (28.49)	65 (50)
TCES personal cognitive subscale	46.66 (7.35)	47 (7)
TCES personal emotional subscale	45.88 (7.52)	46 (13)
TCES professional cognitive subscale	47.93 (6.70)	48 (11)
TCES professional emotional subscale	43.55 (9.12)	42 (9.5)

further substantiates the existing knowledge that inferences regarding physician empathy assessed by self-reported scales do not reflect patient perceptions. Making one step beyond this confirmation, this study denotes that physicians that declare being less empathetic might be perceived by their patients as more empathetic, compared to others. It can be conceivably hypothesized that these physicians may be more likely to underestimate their empathy due to being humbler than others, as empathy and humility seem to be correlated [74].

Further, female sex emerged as a consistent predictor in the TCES cognitive subscales. Indeed, female practitioners seem to express empathy to patients more effectively than their male colleagues, as confirmed by a recent meta-analysis [75]. It has been proposed that the “nurturing investment” theory, suggesting that females have more empathic potential due to offspring raising, may explain this finding [76, 77]. Surprisingly, however, no such evidence was found regarding the TCES emotional subscales; future studies on this topic are therefore required to elucidate these findings. In addition, married and more experienced physicians seemed to declare being more empathetic than others at the personal cognitive and professional cognitive level, respectively, corroborating previous work [77]. Again, the reason why no such correlation was noted at the emotional level remains elusive.

Regarding the correlations between quality of life indices and empathy scales, some mixed results emerged. In particular, the negative correlation between the TCES pro/emo subscale and the physicians’ EQ-5D index score could not be justified based on existing literature and should be read with caution. On the other hand, the positive correlation between the patients’ quality of life and their perception of physician’s empathy concurs well with previous research in different settings [12–15, 78, 79].

Some limitations of this study should be acknowledged. Inevitably, the convergent validity was not assessed due to the lack of another validated tool in Greek assessing physicians’ empathy by their patients. Furthermore, the small sample size of physicians did not allow for multivariate analyses and may have reduced the overall study’s power. Finally, the single-center nature of this study may limit the generalizability of its results.

5. Conclusions

This paper evaluated the psychometric properties of the Gr-JSPPPE and found substantial evidence for its validity and reliability, making it the first validated tool to assess patient perceptions of physician empathy in the Greek language. The evidence from this study also intimates that physician empathy assessed by the self-reported scale is inversely associated with patient perceptions. Female sex, marital status, duration of employment in current post, and quality of life emerged as important predictors of physician empathy, while patient quality of life seemed the only predictor of patient perception of physician empathy. Large-scale multicenter studies could shed more light on empathy, both as reported by the physician and as perceived by the patient, in order to improve clinical care outcomes.

Data Availability

Data are available upon special request.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

Authors’ Contributions

Vasiliki Katsari and Athina Tyritidou contributed equally to this work.

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Research Article

Malay Validation of Copenhagen Psychosocial Work Environment Questionnaire in Context of Second Generation Statistical Techniques

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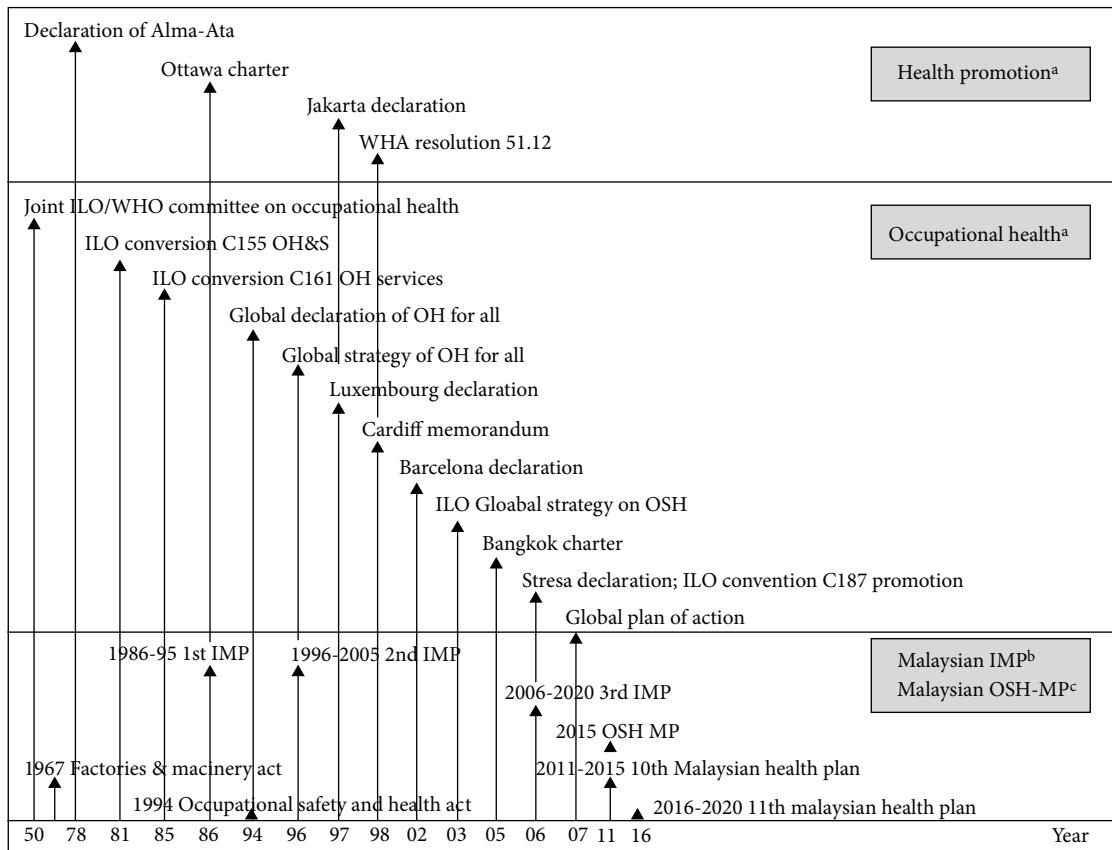
Psychosocial hazards present in workplaces are being actively investigated by researchers from multiple domains. More research and resources are required to investigate the debilitating consequences of these hazards in the developing and underdeveloped countries where this issue remains one of grave concern. This study aims at investigating the psychometric properties of Malaysian version of Copenhagen Psychosocial Questionnaire for reliability and validity purpose. The Malaysian version of COPSOQ is a multidimensional questionnaire; it comprises of 7 major formative constructs and 28 variables with an additional inclusion of two variables which are organizational loyalty and physiological health biomarkers (blood pressure and body mass index) that explicate a reflective construct which has 93 items all catering to assess psychosocial determinants present in workplace environments. Each formative second-order construct is further categorized into different reflective first-order constructs. The focus of this study was only on first-order reflective constructs. Probability sampling was used for data collection from 300 respondents working in industries with a response rate of 100%; structural equation modeling technique was applied for data analysis. All psychometric analysis performed on reflective constructs gave reliable results which demonstrate the validity of Bahasa Melayu (BM-COPSOQ) and its comprehensiveness of including relevant dimensions particularly in context to Asian region. The BM-COPSOQ will fill up the knowledge gap and provide a bridge between researchers, work professionals and practitioners, and many other workplaces for the best understanding of psychosocial work environment.

1. Background

Work, regardless of its nature involves certain occupational risks. In the backdrop of rapidly changing economic circumstances, risks present in workplace settings are becoming more apparent. Previously, biological, biomechanical, chemical, and radiological risks were mostly considered critical however in recent times psychosocial risks have also garnered serious

attention of researchers. The developing and underdeveloped countries have displayed lack of awareness towards these emerging risks and much research needs to be done to tackle these perils in workplace settings [1].

Petrochemical industries by virtue have hazardous work environments that effect the physical and psychosocial condition of its employees. The Malaysian petrochemical industries are labor-intensive industry that presents many



^aGlobal action on workers health

^bMalaysian industrial master plan

^cMalaysian occupational safety and health master plan

FIGURE 1: Action plan on workers health.

environmental, societal, and occupational risks. The safety, health, and wellbeing of the employees must be a priority in such high stress domains and managed prudently by different stakeholders [2].

Malaysia has put a great emphasis on the Occupational Safety and Health (OSH) policy by enacting laws and encouraging best practice guidelines. Different organizations and awareness bodies are active in OSH domain such as Department of Occupational Safety and Health (DOSHH); National Institute of Occupational Safety and Health (NIOSH); Social Security Organization (SOCSO) etc. ensuring employees maintain workplace safety standards. Moreover, International Labour Organization (ILO) and World Health Organization (WHO) have devised different action plans over the years to ensure workplaces can achieve optimal safety. Figure 1 represents different OSH activities carried out around the world and in Malaysia.

2. Introduction

The psychosocial work environment possesses certain risk factors named as psychosocial risk, psychosocial hazards, psychosocial factors, or stressors (often interchangeable) with a significant deleterious effect as highlighted in many recent past

studies [2–18]. These risks are an important area of inquiry precondition to creating healthy workplace environment by striving towards the maximization of workers health and wellbeing as emphasized by international agencies and organizations like International Labour Organization (ILO), World Health Organization (WHO), European Union Occupational Safety and Health (EU-OSHA) agency, Health and Safety Executive (HSE), and many others.

The Copenhagen Psychosocial Questionnaire (COPSOQ) is the best available research instrument to identify the psychosocial work environment. The value of this instrument can be supported with the number of validation studies conducted over the years by researchers internationally such as in Denmark [9], Germany [12, 13], Australia [6], Portugal [17], Spain [11], France [7], Iran [16], Chile [19], China [20], Sweden [3]; and Poland [21].

Majority of the validation studies conducted in the western countries used first generation statistical techniques with limited in-depth analysis. The studies conducted in eastern countries are also limited. In fact, there is no validation study of COPSOQ in the Malaysian context which has used for robust statistical techniques. Therefore, the aim of this research article is to present the Malaysian version of COPSOQ by analyzing the psychometric properties of the instrument. Structural Equation Modeling (SEM), a second generation statistical

techniques is used in this study for robustness findings of Bahasa Melayu (BM) validated version of COPSOQ.

3. Methodology

3.1. Participants. The technical workers are classified as executives and nonexecutives. These workers worked in operational, maintenance, and production activities of the petrochemical industries of Peninsular Malaysia under the leading chemical group which makes a total population of 3523. Initially, 300 total responses were collected, but due to missing values in some of the responses, the responses of 277 subjects were used in the study. From the final 277 subjects, 210 were male and 67 were female aged between 20 and 49 years. All the participants were healthy. Exclusion criteria included the use of illicit drugs, use of any prescribed medication, physical activity practice of more than five consecutive hours without having a leisure break of not less than thirty minutes of duration, provided 8×5 h per week, pregnant women, or women having any disturbance in regular menstrual cycles and ovulation.

3.2. Sampling Design. Multi-stage sampling was used due to large inquiries extending to the considerable large geographical area. The first stage in multi-stage sampling is to select the large primary sampling units like states, then areas and finally people within the selected areas [22]. Javaid et al. in their study have proposed the multi-stage sampling procedure for the petrochemical industries of Malaysia, which this study followed [1,2].

3.2.1. Selection of States. The petrochemical industries in Peninsular Malaysia are located in the states of Johor Bahru, Kedah, Pahang, and Terengganu. The study targeted petrochemical companies, which owns 80% of the shares of petrochemical industries either in the form of fully owned shares or in joint association with other petrochemical Multinational Companies (MNCs) operating in Malaysia. One fully owned and one partially owned industry were selected from each state. Therefore, Johar Bahru state was dropped because of not meeting the selection criteria.

3.2.2. Selection of Petrochemical Industries from the Three Selected States. The states of Kedah, Pahang, and Terengganu were selected to represent petrochemical industries. Kedah state represents only one joint venture and only one fully owned petrochemical industry, therefore, it sets the base criteria for equal representation of the industries from the other two states, i.e., choosing one joint venture and one fully owned industry from Terengganu and Pahang respectively. Following the lottery method technique [22, 23] the names of the petrochemical industries were put in a jar, thoroughly mixed, and the required sample, which is one joint venture and one fully owned firm, from Terengganu and Pahang was randomly drawn. First, the joint venture and fully owned industries in Terengganu were added in the lottery technique followed by Pahang industries that were entered and selected based on the lottery technique.

TABLE 1: No. of respondents per industry.

States	Petrochemical industry category		Total respondents
	Fully owned	Joint venture	
Kertih,	50	50	100
Terengganu	50	50	100
Gebeng, Pahang	50	50	100
Kedah, Gurun	50	50	100
<i>Total respondents</i>	150	150	300

3.2.3. Selection of Study Subjects from Petrochemical Industries. The Simple Random Sampling technique was used to collect data from the provided list of the study subjects. The subjects in three industrial zones were equally divided, which means that 50 subjects from each petrochemical industry were chosen as shown in Table 1. To have a maximum representation of subjects from each targeted industry, both morning and evening shifts were targeted from the provided list. Then, 25 subjects were randomly selected from the morning shift and the remaining 25 subjects were selected from the evening shift from the selected industries. The data from all three industrial zones were collected during normal working days over a period of one month, May 2016.

3.3. Questionnaire. The study constructs were adapted from the second version of COPSOQ II [24], a thorough questionnaire that covers all the aspects that are important to study the psychosocial work environment along with health and wellbeing [16, 25].

3.3.1. Domains of Questionnaire. The BM-COPSOQ consists of 7 different domains. Details of each domain along with relevant specifications are presented in Table 2.

3.3.2. Translation of Questionnaire. The current study was conducted in Bahasa Melayu (BM) the national language of Malaysia; therefore, all the study variables were translated into BM from English using the back translation technique [26]. The forward-then-back translation procedure was completed in multiple steps. Translation and back translation of the internationally recognized base questionnaire into BM were carried out with the help of two certified translators located in Kuala Lumpur, Malaysia. In the first step, the English version was translated into BM by one certified translator, and, in the second step, the back translation from BM to English was done by another certified translator. To retain the originality and authenticity of both translations, the two selected translators (unknown to each other) worked independently. To ensure that the contents of each item were cross-linguistically comparable and generated the same meaning, the researchers used both translated languages in a single questionnaire.

3.3.3. Quantitative Demands. Quantitative Demands (QD) was measured by a 4-item scale, coded by QD1, QD2, QD3, QD4, having items like “does your workload pile up due to uneven distribution?” translated into BM “Adakah beban kerja anda semakin bertimbun disebabkan pembahagian tidak sekata?”

TABLE 2: Total Domains and Dimensions of BM-COPSOQ.

<i>Domains with total items</i>	<i>Dimensions</i>
Demands at work (12 items) <i>Desakan di tempat kerja</i>	Quantitative demands "QD" 4 items Work pace "WP" 4 items Emotional demands "ED" 4 items Influence at work "IW" 4 items
Work organization and job contents (15 items) <i>Penyusunan kerja Dan Kandungan Kerja</i>	Possibilities for development "PD" 4 items Commitment to workplace "CW" 4 items Meaning of work "MW" 3 items Predictability "PR" 4 items Recognition (rewards) "R" 3 items Role clarity "RC" 3 items Role conflicts "RCN" 4 items Quality of leadership "QL" 4 items
Interpersonal relations and leadership (27 items) <i>Hubungan Antara Perorangan Dan Kepimpinan</i>	Social support supervisor "SSS" 3 items Social support colleagues "SSC" 3 items Sense of community "SC" (social community at work) 3 items Job insecurity "JI" 4 items Job satisfaction "JS" 4 items
Work-individual interface (14 items) <i>Hubung Kait Individu-Kerja</i>	Work-family conflict "WFC" 4 items Family-work conflict "FWC" 2 items Trust "T" 7 items Justice and respect "JR" 4 items General health "GH" 1 item Sleeping trouble "ST" 4 items Burnout "BO" 4 items Stress "STR" 4 items
Values at workplace level (11 items) <i>Nilai di tempat kerja</i>	
Health and wellbeing (13 items) <i>Kesihatan dan Kesejahteraan</i>	
<i>Further parameters</i>	
Organizational Loyalty <i>Niat untuk berhenti</i>	Organizational loyalty "OL" (intention to leave) 3 items
Biomarker <i>Biomarker</i>	Blood Pressure "BP" 1 item Body Mass Index "BMI" 1 item

3.3.4. *Work Pace*. Work pace (WP) was measured by a 4-item scale, coded by WP1, WP2, WP3, WP4 having items like "do you have to work very fast?" translated into BM "Adakah anda perlu bekerja dengan sangat cepat?"

3.3.5. *Emotional Demands*. Emotional demands (ED) was measured by a 4-item scale, coded by ED1, ED2, ED3, ED4 having items like "do you have to deal with (or manage) other people's personal problems as part of your work?" translated into BM "Adakah anda perlu berdepan dengan (atau mengurus) masalah peribadi orang lain semasa anda bekerja?"

3.3.6. *Influence at Work*. Influence at work (IW) was measured by a 4-item scale, coded by IW1, IW2, IW3, IW4 having items like "Do you have a large degree of influence on the decisions concerning your work?" translated into BM "Adakah anda mempunyai pengaruh yang kuat terhadap keputusan-keputusan yang melibatkan kerja anda?"

3.3.7. *Possibilities for Development (Skill Discretion)*. Possibilities for development (PD) was measured by a 4-item scale,

coded by PD1, PD2, PD3, PD4 having items like "Does your work require you to take initiative?" translated into BM "Adakah kerja anda memerlukan anda mengambil initiatif?"

3.3.8. *Commitment to Workplace*. Commitment to workplace (CW) was measured by a 4-item scale, coded by PD1, PD2, PD3, PD4 having items like "Do you enjoy telling others about your place of work?" translated into BM "Adakah anda suka bercerita kepada orang lain tentang tempat kerja anda?"

3.3.9. *Meaning of Work*. Meaning of work (MW) was measured by a 3-item scale, coded by MW1, MW2, MW3 having items like "Is your work meaningful?" translated into BM "Adakah kerja anda bermakna?"

3.3.10. *Predictability*. Predictability (PR) was measured by a 4-item scale, coded by PR1, PR2, PR3, PR4 having items like "At workplace are you informed well in advance concerning important decisions, e.g., changes or plans for future?" translated into BM "Di tempat kerja, adakah anda

dimaklumkan awal-awal lagi mengenai keputusan penting, misalnya, pertukaran atau perancangan masa hadapan?”

3.3.11. Rewards (Recognition, Prospect, Wage). Rewards (R) was measured by a 3-item scale, coded by R1, R2, R3 having items like “Is your work recognized and appreciated by the management?” translated into BM “*Adakah kerja anda diiktiraf dan dihargai oleh pihak pengurusan?*”

3.3.12. Role Clarity. Role Clarity (RC) was measured by a 3-item scale, coded by RC1, RC2, RC3 having items like “Do your work have clear objectives?” translated into BM “*Adakah kerja yang anda lakukan mempunyai objektif yang jelas?*”

3.3.13. Role Conflicts. Role Conflicts (RCN) was measured by a 4-item scale, coded by RCN1, RCN2, RCN3, RCN4 having items like “Do you do things at work which are accepted by some people but not by others?” translated into BM “*Adakah anda membuat kerja yang dapat diterima oleh sesetengah orang tetapi bukan yang lain?*”

3.3.14. Quality of Leadership. Quality of Leadership (QL) was measured by a 4-item scale, coded by QL1, QL2, QL3, QL4 having items like “Makes sure that each staff has good development opportunities?” translated into BM “*Memastikan setiap kakitangan baik mendapat peluang kemajuan kerjaya?*”

3.3.15. Social Support Colleagues. Social Support Colleagues (SSC) was measured by a 3-item scale, coded by SSC1, SSC2, SSC3 having items like “How often your colleagues help and support you, if needed?” translated into BM “*Berapa kerapkah (rakan sekerja) anda Membantu dan menyokong anda, jika diperlukan?*”

3.3.16. Social Support Supervisor. Social Support Supervisor (SSS) was measured by a 3-item scale, coded by SSS1, SSS2, SSS3 having items like “How often your immediate supervisor helps and supports you, if needed?” translated into BM “*Berapa kerapkah penyelia anda Membantu dan menyokong anda, jika diperlukan?*”

3.3.17. Sense of Community/Social Community at Work. Sense of Community (SC) was measured by a 3-item scale, coded by SC1, SC2, SC3, SC4 having items like “Is there a good atmosphere between you and your colleagues?” translated into BM “*Adakah wujud suasana persekitaran yang baik antara anda dan rakan sekerja?*”

3.3.18. Job Insecurity. Job Insecurity (JI) was measured by a 4-item scale, coded by JI1, JI2, JI3, JI4 having items like “are you worried about becoming unemployed?” translated in BM “*Adakah anda risau tentang menjadi penganggur?*”

3.3.19. Work-Family Conflict. Work-Family Conflict (WFC) was measured by a 4-item scale, coded by WFC1, WFC2, WFC3, WFC4 having items like “Do you feel that your work drains so much of your energy that it has a negative effect on your personal life?” translated into BM “*Adakah anda berasa*

yang kerja menghabiskan begitu banyak tenaga anda sehingga ia mempunyai kesan negatif ke atas kehidupan peribadi?”.

3.3.20. Family-Work Conflict. Family-Work Conflict (FWC) was measured by a 2-item scale, coded by FWC1, FWC2 having items like “Do you feel that your personal life takes so much of your energy that it has a negative effect on your work?” translated into BM “*Adakah anda berasa yang kehidupan peribadi anda mengambil begitu banyak tenaga sehingga mempunyai kesan negatif ke atas pekerjaan anda?*”

3.3.21. Trust. Trust (T) was measured by a 7-item scale, coded by T1, T2, T3, T4, T5, T6, T7 having items like “Do the employees withhold information from each other?” translated in BM “*Adakah pekerja merahsiakan maklumat antara satu sama lain?*”

3.3.22. Justice and Respect. Justice and Respect (JR) was measured by a 4-item scale, coded by JR1, JR2, JR3, JR4 having items like “Are conflicts resolved in a fair way?” translated in BM “*Adakah konflik diselesaikan dengan cara adil?*”

3.3.23. General Health. General Health (GH) was measured by a 1-item scale, coded by GH1 having item “In general, how would you rate your health?” translated in BM “*pada amnya, bagaimanakah anda kadar kesihattan anda?*”

3.3.24. Sleeping Trouble. Sleeping Trouble (ST) was measured by a 4-item scale, coded by ST1, ST2, ST3, ST4 having items like “How often have you slept badly and restlessly?” translated in BM “*Berapa kerapkah anda tidak dapat tidur dengan lena dan nyenyak?*”

3.3.25. Burnout. Burnout (BO) was measured by a 4-item scale, coded by BO1, BO2, BO3, BO4 having items like “How often have you felt worn out?” translated in BM “*Berapa kerapkah anda berasa lesu?*”

3.3.26. Stress. Stress (STR) was measured by a 4-item scale, coded by STR1, STR2, STR3, STR4 having items like “How often have you had problems relaxing?” translated in BM “*Berapa kerapkah anda mempunyai masalah untuk berehat?*”

3.3.27. Job Satisfaction. Job Satisfaction (JS) was measured by a 4-item scale, coded by JS1, JS2, JS3, JS4 having items like “Regarding your work in general how pleased are you with your work prospects?” translated in BM “*Berkenaan kerja anda pada keseluruhannya, adakah anda puas hati dengan prospek pekerjaan anda?*”

3.3.28. Organizational Loyalty. Organizational Loyalty (OL) was measured by a 3-item scale, coded by OL1, OL2, OL3 having items like “I sometimes feel like leaving this employment for good?” translated in BM “*Saya kadang-kadang terasa seperti hendak meninggalkan ini untuk selamanya?*”

3.3.29. Biomarker – Blood Pressure. Blood Pressure (BP) was measured as per practice guidelines of the European society of hypertension [27, 28]. The mean arterial blood pressure

TABLE 3: Constructs reliability and validity.

Constructs	Construct-items	Loadings	CR	CronBach	AVE	FVIF
<i>Demands at work</i>	QD1	0.865				
	QD2	0.898	0.909	0.85	0.77	1.597
	QD3	0.868				
	WP1	0.827				
<i>Work pace</i>	WP2	0.883				
	WP3	0.909	0.927	0.895	0.761	1.541
	WP4	0.869				
	ED1	0.747				
<i>Emotional demands</i>	ED2	0.748				
	ED3	0.850	0.869	0.799	0.625	2.295
	ED4	0.813				
	IW1	0.650				
<i>Influence at work</i>	IW2	0.710				
	IW3	0.732	0.817	0.701	0.53	1.397
	IW4	0.811				
	PD1	0.663				
<i>Possibilities for development</i>	PD2	0.767				
	PD3	0.789	0.830	0.727	0.551	1.421
	PD4	0.744				
	CW1	0.844				
<i>Commitment to workplace</i>	CW2	0.756				
	CW3	0.762	0.833	0.731	0.559	1.297
	CW4	0.608				
	MW1	0.835				
<i>Meaning of work</i>	MW2	0.893	0.879	0.792	0.707	1.56
	MW3	0.793				
	PR1	0.789				
	PR2	0.833				
<i>Predictability</i>	PR3	0.758	0.823	0.711	0.544	1.321
	PR4	0.534				
	R1	0.886				
	R2	0.917	0.924	0.876	0.802	2.478
<i>Recognition</i>	R3	0.882				
	RC1	0.825				
	RC2	0.929	0.901	0.834	0.752	1.599
	RC3	0.844				
<i>Role clarity</i>	RCN1	0.669				
	RCN2	0.803				
	RCN3	0.855	0.852	0.767	0.592	1.334
	RCN4	0.738				
<i>Role conflicts</i>	QL1	0.812				
	QL2	0.871				
	QL3	0.850	0.913	0.873	0.725	2.225
	QL4	0.871				
<i>Social support colleagues</i>	SSC1	0.899				
	SSC2	0.900	0.919	0.868	0.791	1.906
	SSC3	0.869				
	SSS1	0.943				
<i>Social support supervisor</i>	SSS2	0.944	0.957	0.932	0.88	2.217
	SSS3	0.927				
	SC1	0.890				
	SC2	0.910	0.914	0.858	0.779	1.951
<i>Sense of community</i>	SC3	0.847				

TABLE 3: Continued.

Constructs	Construct-items	Loadings	CR	CronBach	AVE	FVIF
<i>Job insecurity</i>	JI1	0.810	0.865	0.791	0.615	1.175
	JI2	0.746				
	JI3	0.814				
	JI4	0.766				
<i>Job satisfaction</i>	JS1	0.741	0.907	0.862	0.711	1.882
	JS2	0.823				
	JS3	0.878				
	JS4	0.920				
<i>Work-family conflict</i>	WFC1	0.712	0.905	0.857	0.707	2.866
	WFC2	0.905				
	WFC3	0.930				
	WFC4	0.797				
<i>Family-work conflict</i>	FWC1	0.960	0.959	0.915	0.922	1.992
	FWC2	0.960				
<i>Trust</i>	T3	0.640	0.838	0.741	0.566	2.314
	T4	0.827				
	T5	0.758				
	T7	0.773				
<i>Justice and respect</i>	JR1	0.771	0.865	0.791	0.617	2.982
	JR2	0.796				
	JR3	0.844				
	JR4	0.726				
<i>General Health</i>	GH1	1.000	1	1	1	1.171
	ST1	0.755				
<i>Sleeping trouble</i>	ST2	0.874	0.918	0.879	0.738	1.672
	ST3	0.877				
	ST4	0.921				
	BO1	0.917				
<i>Burnout</i>	BO2	0.903	0.947	0.925	0.817	2.379
	BO3	0.873				
	BO4	0.922				
	STR1	0.582				
<i>Stress</i>	STR2	0.870	0.892	0.833	0.679	2.798
	STR3	0.901				
	STR4	0.899				
	OL1	0.879				
<i>Organizational loyalty</i>	OL2	0.869	0.854	0.74	0.664	1.258
	OL3	0.681				
<i>BMI</i>	BMI	1.000	1	1	1	1.171
<i>MAP</i>	MAP	1.000	1	1	1	1.417

(MAP) is defined as average blood pressure in an individual during a single cardiac cycle as shown in the following equation:

$$MAP = SBP + \frac{2(DBP)}{3}. \quad (1)$$

In this equation, SBP is the systolic blood pressure and DBP is the diastolic blood pressure. The unit of mean arterial pressure (MAP) is measured in mmHg. MAP is used to approximate the pressure gradient (ΔP) of the subjects and includes the effect of systolic and diastolic pressure. Measurements from left arm was taken and measured as "Systolic blood pressure reading 1, left arm" and "Diastolic blood pressure

reading 1, left arm," translated in BM as "Tekanan darah sistolik Bacaan 1, Tangan kiri" and "Tekanan darah diastolik Bacaan 2, Tangan kiri," respectively. Similarly, for right arm it was measured as "Systolic blood pressure reading 2, right arm" and "Diastolic blood pressure reading 2, right arm," translated in BM as "Tekanan darah sistolik Bacaan 2, Tangan kanan" and "Tekanan darah diastolik Bacaan 2, Tangan kanan," respectively.

3.3.30. Biomarker – Body Mass Index. WHO BMI index is defined as weight in kilograms divided by the square of the height in meters (kg/m^2). BMI was calculated with the following formula:

TABLE 4: Discriminant validity.

	(a)													
	QD	WP	ED	IW	PD	CW	MW	OL	PR	R	RC	RCN	QL	SSC
QD	0.877													
WP	0.354	0.872												
ED	0.463	0.386	0.791											
IW	0.136	0.228	0.256	0.728										
PD	0.262	0.238	0.134	0.331	0.742									
CW	0.059	0.059	0.120	0.073	0.105	0.747								
MW	-0.082	0.040	-0.162	0.113	0.222	0.097	0.841							
OL	0.120	0.132	0.233	0.000	0.045	-0.026	-0.210	0.815						
PR	-0.069	0.118	0.011	0.072	0.131	0.075	0.169	-0.107	0.737					
R	-0.180	0.052	-0.336	0.136	0.033	0.079	0.293	-0.240	0.324	0.895				
RC	-0.210	-0.012	-0.212	0.058	-0.030	0.045	0.434	-0.234	0.237	0.320	0.867			
RCN	0.222	0.119	0.252	0.009	0.064	0.288	-0.084	0.140	-0.124	-0.222	-0.115	0.770		
QL	-0.142	0.133	-0.226	0.117	0.113	-0.045	0.296	-0.253	0.302	0.517	0.294	-0.140	0.851	
SSC	-0.229	-0.063	-0.232	0.139	0.133	0.136	0.304	-0.203	0.274	0.265	0.289	-0.046	0.337	0.889

(b)

	SSS	SC	JI	JS	WFC	FWC	T	JR	GH	ST	BO	STR
SSS	0.938											
SC	0.375	0.883										
JI	-0.012	-0.178	0.784									
JS	0.394	0.484	-0.117	0.843								
WFC	-0.301	-0.233	0.263	-0.286	0.841							
FWC	-0.163	-0.215	0.158	-0.235	0.667	0.960						
T	0.473	0.424	-0.119	0.445	-0.222	-0.168	0.752					
JR	0.497	0.297	-0.129	0.402	-0.359	-0.251	0.665	0.785				
GH	0.115	0.115	-0.035	0.150	-0.168	-0.104	0.009	0.091	1.000			
ST	-0.219	-0.074	0.065	-0.156	0.387	0.331	-0.185	-0.218	-0.128	0.859		
BO	-0.180	-0.198	0.150	-0.187	0.513	0.378	-0.150	-0.248	-0.160	0.522	0.904	
STR	-0.255	-0.254	0.151	-0.285	0.577	0.375	-0.282	-0.335	-0.133	0.540	0.707	0.824

Note: The square roots of average variances extracted (AVEs) shown on diagonal with italic numbers.

$$BMI \left[\frac{kg}{m^2} \right] = \frac{\text{Weight in Kilometers}}{\text{Height in Meters} \times \text{Height in Meters}}. \quad (2)$$

BMI as endogenous non-invasive biomarker variable was calculated with a single item. Weight was measured in kilograms “How much do you weigh?” translated into BM “Berapakah berat anda?” Height was measured in meters “How tall are you?” translated into BM “Berapakah ketinggian anda?”

3.4. Statistical Approach. In this study the complexity of the model is high and therefore we have used Partial Least Squares Structural Equation Modeling (PLS-SEM) technique to evaluate the psychometric properties of Copenhagen psychosocial work environment questionnaire [29]. They further argued, a model involving reflective and formative constructs is reflected as a multifaceted measurement model. Copenhagen scale consists of reflective constructs on first-order level and formative constructs on second-order level. For instance, demands at work is a second-order formative construct which is based on three first-order reflective constructs such as emotional demands, work pace, and quantitative demands as shown in

Table 2. However, in this study, we only aimed to examine the first-order reflective constructs for psychometric properties via applying the second generation tool, i.e., PLS-SEM. The first-order reflective constructs of Copenhagen are discussed in Table 2 under dimensions section.

In order to examine the quality of reflective constructs in terms of reliability and validity, we used the following standards as suggested that the item loading should be greater than 0.60 or at minimum value of 0.40, the Cronbach’s alpha and composite reliability are to be at 0.70 or greater, and the convergent validity also termed average variance extracted (AVE) must exceed the value 0.50.

Another criterion to examine the reflective construct is discriminant validity which is defined as to what extent each latent variable is different from other variables in a study model. Few authors added that the AVE of each variable must be greater than the highest squared correlation of variables with any other latent variables in the model to form discriminant validity [29, 30].

The study analyses were conducted using WarpPLS 6.0 [31] software as it provides us many options for the assessment

of outer model parameters and calculating the latent variables scores (LVs). Using WarpPLS 6.0, we performed the algorithm, i.e., PLS regression for outer model to assess the first-order reflective measurement (outer) model parameters and LVs. The results of first-order reflective measurement model comprising factor loadings, Cronbach's alpha, composite reliability (CR), AVE, and discriminant validity are discussed in Tables 3 and 4, respectively.

3.5. Results. Using the WarpPLS, we assessed the first-order reflective dimensions for their reliability and validity in terms of indicator loadings, Cronbach's alpha, composite reliability, convergent validity, and discriminant validity. The results shown in Table 3 reported that the indicator loadings have exceeded the critical value of 0.40 to retain an item. However, few items did not meet threshold value of 0.40, for instance, QD4 of quantitative demands and T1, T2, and T6 of trust variable. Next, we checked the reliability tests comprising Cronbach's alpha and composite reliability and found that all constructs are reliable as they met the critical value of 0.70. We also evaluated the convergent validity via using the criteria of AVE and resulted that all reflective constructs have achieved the AVE value of 0.50, hence verifying that all constructs had met the requirement of convergent validity, see Table 3.

Another criteria to examine the reflective constructs of BM-COPSOQ, is by means of discriminant validity. While assessing the discriminant validity, we compared the square root of AVE with the correlation of latent variables. As a result, Table 4 showed that there is no discriminant validity issue as the square root of AVE of all constructs is greater than the correlation of other variables as shown in Table 4.

We also calculated the full Collinearity (FVIF) which refers to the vertical and lateral Collinearity of one construct in association with other variables [32]. They further suggested that FVIF is another source to establish the discriminant validity and the critical value of FVIF should be equal to or less than five. As shown in Table 3, we have found that none of FVIF is greater than the threshold value.

4. Discussion and Conclusion

We have evaluated the psychometric properties of BM-COPSOQ using a sample of Malaysian Petrochemical Industry workers with the help of probability sampling for data gathering and SEM technique for data analysis. Main goal of this study was to provide a valid and reliable psychosocial work environment questionnaire for an eastern industrially developing country Malaysia in Bahasa Melayu.

The BM-COPSOQ is a standardized self-report measure which is comprised of 7 constructs having 28 variables with 93 items designed for the assessment of psychosocial workplace environment. The details of each construct followed by variables and number of items are already summarized in aforementioned Table 2. The 4 items, i.e., one from the "quantitative demands" and 3 from "trust" were dropped due to low factor loadings. The composite reliability of all the items is well above 0.7 so as average variance extracted which is more than 0.5 for all variables.

We have added a construct "further parameter" having two variables in it which are "organizational loyalty" and "biomarkers". Organizational loyalty is measured by three items while biomarker is made up of blood pressure and body mass index which are physiological health measures. The details of measurement of each physiological variable are already explained in Sections 3.3.29 and 3.3.30. Organizational loyalty (Intention to leave) is predicted as another outcome of working condition which results from psychosocial hazards.

Several strengths of this study need to be highlighted. Firstly, the inclusion of two physiological health biomarkers (BP and BMI). In behavioral studies, the use of biomarkers in context to the psychosocial work environment factors is largely lacking. The inclusion of two non-invasive health biomarkers was used as a screening tool to measure the physiological health of the workers besides psychological such as stress and burnout in the psychosocial work environment. The screening tools will help workers to keep updated with their health conditions due to psychosocial risks emerged around them. Secondly, the use of SEM for evaluating the psychometric properties of BM-COPSOQ and to ensure the robustness of the results which eventually we have found by achieving the validity and reliability of the items well above their minimum cut off values. Thirdly, the probability sampling technique to reach out the technical samples working in different states of highly hazardous petrochemical industries ensured greater confidence in results.

There were some limitations to this study. Firstly, the study sample is based on workers working only in the petrochemical industries of Peninsular Malaysia which should be expanded to different regions, branches and professions in the country. Secondly, this study is limited to only evaluate the psychometric properties of BM-COPSOQ. Our upcoming research article focuses on COPSOQ III where we have thoroughly evaluated the impact of all the higher-order constructs such as Demands at Work; Work Organization and Job Content; Interpersonal Relations and Leadership; Work-Individual Interference; & Health and Wellbeing (inclusive of health non-invasive biomarkers) in lieu to CORE and additional items. These higher-order constructs will be used as reflective-formative constructs to widen the scope of COPSOQ [33, 34].

Data Availability

Data of 277 study samples used will be provided on request.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Review Article

Emerging Issues in Occupational Disease: Mental Health in the Aging Working Population and Cognitive Impairment—A Narrative Review

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Cognitive impairment has often been reported in scientific literature as a concern derived from chronic exposure to work-related stress. Organizational factors can contribute to the onset of this concern especially in a susceptible population such as elderly workers. The aim of our study was to review the last five years of scientific literature, focusing on experimental and epidemiological studies, possible mechanisms implicated in the onset of cognitive decline due to work-related stress, and the recent organizational strategies to prevent detrimental effects of stress on cognitive processes. A literature search was performed in scientific platforms Medline and Web of Science, by means of specific string search terms, restricting the search to the years of publication 2014–2019. Thirty-three articles were identified and qualitatively evaluated, reporting narratively the main point of interest. At this stage, six articles were excluded because they did not meet the inclusion criteria. Only a few articles considered the population of the elderly workers, often with a short follow-up period. Strategies to manage stress with organizational procedures are scarce. Mechanisms implicated in the development of cognitive impairment due to stress are not fully explained and seem to include a chronological decrease in the inhibitory process of neurological pathways. Further research that focused on strategies to manage stress in elderly workers, with the aim of preventing cognitive impairment processes, is warranted.

1. Introduction

Mental health in occupational settings is a major topic for occupational medicine, psychology, and social science [1, 2], with important implications for general health, psychological well-being, and company productivity [3, 4]. Since the decrease of classic occupational disease, due to the general improvement of working conditions, more attention is being paid to the mental well-being of employees. In the last five years, a consistent number of publications have been produced on this topic [5–8]. Modern industry 4.0 is changing the way of working, requiring high mental performance along with low physical effort. In fact, industry 4.0 represents

the global trend towards automation and data exchange in manufacturing technologies. The term industry 4.0, often intended as a synonym of the fourth industrial revolution, include innovative processes such as the Internet of things (IoT), cyberphysical systems, and cognitive computing and artificial intelligence. Modern 4.0 factories are characterized by high connectivity between production lines and operators' control through a system that can visualise the entire production line and make decisions on its own.

This high technological scenario needs extensive adaptability of the workforce, and some population groups, such as elderly workers, could be more vulnerable to develop stress due to being less predisposed to change [9, 10].

The global aging of the working population could contribute to the problem that needs policy strategies to support and promote an active aging of the elderly population [11], considering also the occupational stress contribution to poor psychological and physical health, in terms of work-related stress, work-family conflict, shift work, and bullying behaviors [12, 13]. Since elderly people are per se more prone to develop a cognitive impairment due to their age advancing [14], the other risk factors that can accelerate this process may be prevented [15, 16]. A relationship between work-related stress and cognitive impairment has been recently reported in several scientific reports and literature reviews [17, 18]. Thus, there is sufficient evidence to consider work-related stress as a factor that is able to contribute to cognitive impairment. Since work-related stress could lead to cognitive impairment, its impact on a more susceptible population, such as elderly people, could be more pronounced. The role of occupational stress in the development of cognitive impairment and its impact on the elderly workforce have not been fully investigated, and the mechanisms implicated and organizational strategies to prevent the onset of stress and its consequences are not fully understood. The aim of this study was to investigate, through a narrative literature review restricted to the last five years, the relationship of work-related stress on cognitive impairment in the elderly working population, along with organizational preventive strategies and the pathophysiological causes of the mental decline attributable to high psychologically demanding work environments.

2. Materials and Methods

A literature review was performed in Medline and Web of Science databases. We considered articles published in the last five years, from 1 January 2014 to 31 March 2019. We selected articles published in the English language, including only studies performed with human samples. Following the PICO strategy for scientific research (population, intervention, comparison, and outcomes) [19], a specific string of search was used, including the most common search term for each PICO topic: Population, Intervention, Comparison, and Outcome.

Inclusion criteria were as follows:

- (i) Study population: working population aged over 18 years
- (ii) Study design: cross-sectional studies, longitudinal studies with a follow-up case, case-control studies, and randomized clinical trials
- (iii) Exposure: work-related stress, occupational stress, job strain, job control, job support, and effort-reward imbalance
- (iv) Outcome: cognitive abilities measured in terms of errors, injuries, processing speed, alertness, distraction, memory, and testing of intellectual skills (e.g., intelligence)
- (v) Publication type: articles in scientific journals

Exclusion criteria were as follows:

- (i) Study population: working population less than 18 years old and animal samples
- (ii) Study design: reviews, meta-analyses, and case report studies
- (iii) Exposure: psychological stress related to caregiver activity, physical stress, chemical exposure, biological risk factors exposure, heat stress, and oxidative stress
- (iv) Outcome: short-term cognitive impairment and structural changes of the brain
- (v) Publication type: letters to the editor, comments, abstracts, and book chapters

The following search terms were combined in several search term strings:

Population: workers, occupational group, working population, work, job, and job task. Exposure: stress, work-related stress, job strain, strain, job demand, job control, job support, effort, reward, effort-reward imbalance, organizational factors, and work organization. Outcome: cognitive impairment, cognitive effects, cognitive behavior, memory, and cognitive tasks.

A total of 214 articles were identified and listed to evaluate if they met the inclusion criteria. By means of a title-abstract screening, articles were defined as eligible for inclusion and then integrally read. Only articles that met the inclusion criteria were then included after a complete reading of the full text.

3. Results and Discussion

Figure 1 shows a flow diagram of the literature search strategy and the review process following PRISMA 2009 flow diagram rules [20]. Twenty-seven articles that met inclusion criteria at the title-abstract reading stage were identified and evaluated.

A consistent number of studies about the relationship between occupational stress and cognitive impairment in the aging population were published. Recent research focused not only on the onset of dementia or Alzheimer's disease [21] but also on those subclinical changes in mental performance that can conduct a more important cognitive decline in elderly people.

A clinical case-control study performed by Eskildsen et al. [22] considered the relationship between work-related stress and the impairment in neuropsychological test performance, finding that self-reported stress patients had the worst performance in prospective memory, speed, and complex working memory, compared with controls without work-related stress. Despite this, the cross-sectional study design does not allow the inference about the causality of occupational stress affecting neuropsychological performances. Moreover, chronic cognitive impairment cannot be evaluated with a cross-sectional study design. The same authors repeated the assessment of neuropsychological performance in the same group of patients and controls after one year [23] and found that the former patients with prolonged work-related stress continued to perform worse

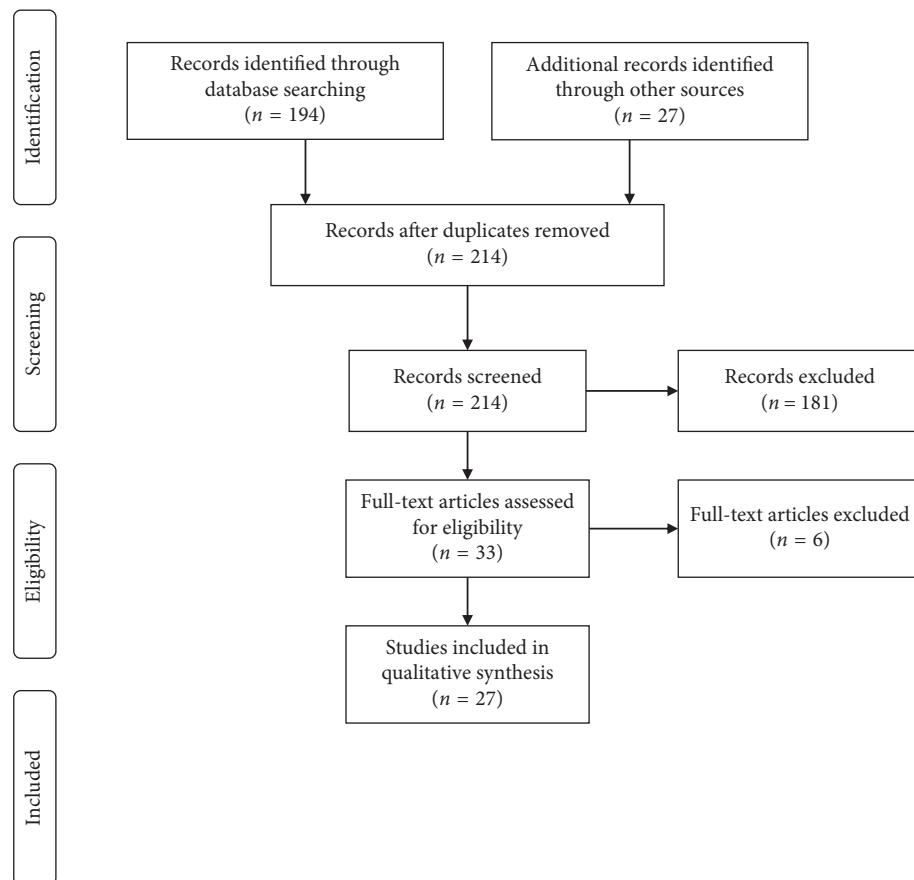


FIGURE 1: Flow diagram of the literature search strategy and review process, following PRISMA 2009 flow diagram rules.

than controls, with a significant impairment also in memory function. Despite the short follow-up of only one year, the study demonstrated that prolonged work-related stress could have a detrimental prolonged effect on cognitive function. Another study by Eskildsen and colleagues in 2017 investigated a change in cognitive impairments in midlife patients (mean age: 44 years) with work-related stress and found a partial association with a change in perceived stress and sleep disturbances over time [24].

Focusing on elderly people, two studies conducted by Sindi et al. in 2017 [21, 25] strengthen the hypothesis of an influence of work-related stress on cognitive performances. They found a significant association between higher levels of midlife work-related stress (mean age at the baseline of 50 years) and worse performance on global cognition and processing speed and a higher risk of mild cognitive impairment, dementia, and Alzheimer's disease in later life (mean ages at the reexamination phases of 71 and 78 years, respectively). The association was not seen after the extended follow-up possibly reflecting a critical time window for the effects of midlife stress. The long mean follow-up period (25 years) and the adequate sample size (2000 subjects at the initial phase) make the study a high-quality investigation. The importance of considering the subclinical effects of cognitive impairment due to work-related stress has to be considered in light of how this can impact the global population level, resulting in worse cognitive performance.

Similar evidence was reported by Agbenyikey et al. [26], who found that high job strain and low job control, at midlife, in a sample of 1429 Caucasian residents (median age at the baseline of 46 years) are associated with decline in verbal learning and memory, with a more evident association for the younger subgroup of participants (<65 years). Considering that, in the European Union (EU) Member States, the most general retirement age is 65 years [27], a more pronounced association exactly in this age class underlines the importance of this evidence in a population that is still working. Consistent with Sindi et al.'s study, the onset of cognitive impairment seems to have a window period in the youngest old instead of the oldest old.

On the other hand, a longitudinal study performed by Andel et al. [28] found that less job control and greater job strain were not significantly associated with change in episodic memory in the period leading up to retirement but were associated with significantly poorer episodic memory at retirement and an accelerated rate of decline in episodic memory following retirement. A longitudinal study performed by Sabbath and colleagues, published in 2016, deals with the problem of cognitive impairment in older age, by investigating which psychosocial work characteristics are able to predict changes in a cognitive function [29] of a sample aged more than 55 years. They argue, in an inconclusive manner, that low-control jobs during working life may be associated with impairments in cognitive function in

early old age. These findings are in line with the aforementioned studies, adding new insight about how kinds of psychological work characteristics are more prone to promote a cognitive impairment, such as types of work characterized by a low decision latitude. Improving job control could be a valid strategy to slow down cognitive decline due to the combined effect of age and work stress.

Another longitudinal study performed by Rijs and colleagues in a population of employees aged 55–64, considering nonemployees as the control group, found that middle-aged workers are equally likely to experience memory complaints as nonworking age-peers, but on the other hand, among workers, those with cognitively demanding work were more likely to have memory complaints [30]. Jonsdottir and colleagues presented a case-control follow-up, testing the differences in the cognitive assessment of patients with stress-related exhaustion several years after they initially sought medical care [31]. They found that patients (mean age of 46 years at the baseline) still performed significantly poorer than controls (mean age of 50 years at the baseline) with regard to cognitive functions, suggesting a prolonged effect of work-related stress exhaustion that has to be taken into consideration at the moment of their return to work. In fact, a cognitive impairment could still be present at the resumption of the work activity, contributing to worse job performance. However, the small sample size limited the interpretation of results. Focusing on the postmenopausal women, in a study conducted in women aged between 45 and 66 years, negative correlations were observed between the majority of cognitive functions and the intensity of stress at work and the majority of factors that caused this stress [32].

Possible mechanisms implicated in cognitive impairment due to work-related stress exposure have been investigated by Landolt and colleagues [33]. Although the study was conducted in a small population of young workers between 16 and 24 years, the results suggest that a reduction in vagal activity seems to have a detrimental effect on reducing decision making and reaction time in subjects exposed to prolonged work-related stress. A study by Marshall and colleagues in a sample with a mean age of 68 years [34] suggested a role of stress on affecting elderly participants' inhibitory control in attentional and sensorimotor domains. Results of this study are in the same direction of research performed by Landolt and colleagues, supposing a reduction in vagal activity and inhibitory control as a mechanism able to affect cognitive performance, although the first was performed in a young population (mean age: 18 years), and the second in an elderly population (mean age: 68 years), considering as a control group a sample of young subjects (mean age: 21 years).

Sokka and colleagues conducted an experimental case-control study in 2016 [35] in a sample of 30 participants affected by burnout (mean age of 47 years) and observed a decrease in working-memory related P3b responses over the posterior scalp and an increase over frontal areas, with respect to the control group. These results suggest that burnout is associated with deficits in the cognitive control needed to monitor and update information in working

memory. Boschi and colleagues found that a relationship between high cognitive disorganisation and high cardio-pulmonary and anger scores as well as low perceived self-efficacy was associated with high cognitive disorganisation, suggesting a putative role of thinking patterns and state of mind on visceral factors. In particular, perception of what is stressful may lead to the body's stress activation pathways, which in turn may cause cognitive impairment [36]. Interactions between social and genetic risk factors have been investigated by Hasselgren who found a significant effect of work control on dementia risk only for men, along with a moderation effect of the major genetic risk factor for Alzheimer's disease, that is, apolipoprotein E allele [37]. These findings highlight the importance of such interactions between social and genetic risk factors to better understand multifactorial diseases such as dementia.

Some studies deal with the efficacy evaluation of a stress-management intervention, such as an aerobic training program or an individual cognitive behavior therapy, on improving cognitive performance in workers exposed to occupational stress, by means of a controlled randomized clinical trial. While aerobic training at a moderate-vigorous intensity within a multimodal rehabilitation program seems to improve episodic memory in patients (mean age of 42 years) with work-related exhaustion disorder [38], the combination of an individual cognitive behavioral therapy (CBT) with a brief workplace intervention fails to demonstrate a reduction in cognitive difficulties at any time point during a 10-month follow-up [39]. A possible contribution of a better work organization for the prevention of a cognitive decline in aging workforces was suggested by a longitudinal study performed by Riedel and colleagues [40]. They reported a positive association of balanced exchange between high effort and high reward at work with improved cognitive function over 6 years among a group of the middle-aged population (mean age of 44 years at the baseline), where the cognitive function was assessed by perceptual speed and verbal fluency. Further research aimed at clarifying the best strategies to improve cognitive performance impairment due to work-related stress is warranted.

In a cross-sectional study performed by Allan and colleagues [41], high occupational stress was related to more frequent failures of attention, memory, and concentration in telephone nurses (mean age of 41 years), with relevant consequences on the decision-making process. Due to the cross-sectional study design, it is not possible to make inferences about the direction of causality in the reported associations. Nevertheless, it is important to underline the possible impact of cognitive failure in job tasks with high responsibility, such as health care workers. These results suggest that burnout is associated with deficits in the cognitive control needed to monitor and update information in working memory. Similarly, Barbe et al. found a linkage between perceived stress, subjective concerns about cognitive function, and impairment of work function [42]. On the contrary, Lees and Lal did not find any association between stress and cognitive performance in a sample of middle-aged nurses with a mean age of 37 years [43].

A case-control study conducted by Golonka and colleagues deepened the psychobiological nature of burnout and its effect on cognitive impairment by means of an EEG monitoring during a specific error monitoring trial. They found emerging cognitive problems in the nonclinical burnout group with respect to the control group [44]. Once again, the mean age of participants was 36 years old. That middle age class does not allow these findings to be extended to older workers.

4. Conclusions

Our narrative review provides an update of the emerging problem of the decline of cognitive performance in elderly workers exposed to work-related stress. Despite the relevant number of studies published on the topic of cognitive impairment due to work-related stress, few studies were conducted in an elderly population of workers that is per se more prone to develop cognitive impairment, due to the multifactor causality of this problem. In conclusion, the present narrative review highlighted the importance of taking into consideration the subclinical detrimental effect of stress on the mental performance of workers exposed to prolonged work-related stress, especially in those jobs that require a high level of concentration and decision making resources. Moreover, some gender and genetic factors seem to play a relevant role in the complex linkage between work-related stress and cognitive impairment, underlying a multifactor genesis of cognitive outcomes including organizational, genetic, and behavioral factors. These findings can be useful to target improvement strategies aimed at enhancing the active aging of the population of the elderly workers. Further research is warranted to enhance our understanding of how a better organizational environment can improve the psychological and mental health of elderly workers.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Research Article

Erratic Behavioral Attitude Leads to Noncommunicable Diseases: A Cross-Sectional Study

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Background. The burden of noncommunicable diseases (NCDs) in the Arab world has reached an alarming level. Behavioral risk factors including consumption of fast food, inadequate sleep, and skipping meals are pervasive. This study aims at establishing the association between NCDs and modernized behavioral risk factors among populations. **Methods.** A cross-sectional study was carried out with 1070 respondents who were 18 years old. The data were collected using a structured questionnaire with the help of the WHO STEPS approach with some modifications regarding NCD risk factors. **Results.** 30% of respondents had cardiovascular diseases (CVD) followed by respiratory diseases (23%) and diabetes (3%) while the habit of smoking was found among 52% of respondents followed by physical inactivity (49%), skipping meals (24%), and inadequate sleep (30%). Consumption of fast food was found to be a significant risk factor for obesity (odds ratio (OR) = 2.72, 95% confidence interval (CI) [1.50, 4.92]), CVD (OR = 1.52, 95% CI [1.20, 1.94]), and respiratory disease (OR = 2.13, 95% CI [1.58, 2.86]). Significant linkages were found between CVD and smoking (OR = 0.69, 95% CI [0.54, 0.88]), diet pattern (OR = 1.86, 95% CI [1.44, 2.39]), fast food (OR = 1.52, 95% CI [1.20, 1.94]), and sleep hours (OR = 0.57, 95% CI [0.42, 0.79]). **Conclusions.** Undesirable behavioral risk factors pose a considerable threat to public health with a high prevalence rate of NCDs. Reducing the NCD burden and promoting healthy lifestyle formation of suitable strategies and their smooth implementation is the need of the hour.

1. Introduction

With the epidemiological transition, noncommunicable diseases (NCDs) are a major concern all over the globe. Their prevalence has been found to be around 40% in developing countries and 10% in developed countries, in the age group of 30–70 years. NCDs are also responsible for high economic burden on a country by affecting the productivity of its citizenry and high treatment cost as well. Patients affected by lifestyle-induced NCDs have the highest rate of premature mortality. The prime cause of high magnitude of NCDs is unhealthy dietary behavior of the population concerned.

In earlier times, communicable diseases were the major cause of deaths, but now NCDs have replaced them as the major causative agents of mortality. Data show that 57% of annual

deaths were caused by CVDs, diabetes, chronic respiratory diseases (CRDs), and cancers in the majority of the countries in the Eastern Mediterranean Region (EMR) in 2012 [1].

According to a recent WHO report, NCDs cause 41 million deaths every year, which is nearly 71% of total deaths across the globe. NCDs kill around 15 million people each year who are under the age group of 30 to 69 years and over 85% of these deaths take place in developing countries [2].

According to the report by the WHO (2014), NCDs are estimated to account for 78% of total deaths, out of which CVDs claimed maximum lives (46%) followed by cancers (10%), diabetes (5%), COPDs (3%), and other NCDs (14%) [3].

Treatment for an NCD is a costly affair. It is estimated that diabetes treatment costs SAR 17 billion (\$4.5 billion) while the treatment for cancer is estimated at SAR 82,500

(\$22,000) per patient per year, and it is reported that by 2030, the financial burden of cancer may exceed SAR 2 billion per year. In 2015, the treatment for asthma aggregated SAR 10 billion, and it is estimated that by 2030, the treatment of asthma may exceed SAR 20 billion [4].

Other than unhealthy dietary behavior, some economic and social crises are also linked to NCDs. High rate of unemployment, unhealthy work environment, low wages, and high workload were also held responsible for an increased rate of mood disorders, anxiety, depression, and suicide. Studies indicated that these problems may have also affected the general health of workers by increasing the risk of cardiovascular and respiratory diseases [5, 6].

In 2016, the population of Saudi Arabia was over 31 million individuals, all of whom require healthcare services in some capacity. In 2016, children and youth under 15 years of age represented 30.35% of the Saudi population, adults between 15 and 64 years of age represented 65.46%, whereas seniors over the age of 65 comprised 4.17% of the population. In 2016, Ministry of Health's Statistical Yearbook reported the total number of visits to the primary healthcare centers and private, general, and polyclinics was nearly 138 million visits; 3,451,377 cases represented the total number of inpatients in the hospitals of all health sectors: 49.4% of them were in MOH hospitals. The statistical yearbook also reported 49,817,811 visits to health centers and 64,346,910 visits by outpatients to MOH hospitals.

The alarming burden of NCDs is due to the rising ubiquity of behavioral and metabolic risk factors for these noncommunicable diseases [7]. A risk factor is an attribute, or subjection of a person, which increases the odds of contracting a noncommunicable disease. Knowledge about these risk factors can be used to reduce the distribution of these risk factors considerably. The risk factors are classified into 3 types: behavioral, metabolic, and biochemical. Behavioral risk factors include smoking, alcohol consumption, unhealthy diet intake, low fruit and vegetable consumption, stress, and sedentary lifestyle. However, there are other risk factors such as irregular meal patterns, fast food consumption, and inadequate sleep. These are equally responsible for the development of NCDs as established risk factors in a population. The study was conducted with the objectives to examine these risk factors jointly with NCDs, especially in the Arab world. This study describes the association of NCDs with social and individual behavior.

2. Materials and Methods

2.1. Type of Study. This is a cross-sectional epidemiological study on NCD risk factors applying a modified WHO STEP-1 procedure in the capital city of Asir Province near the Red Sea in southwest Saudi Arabia. This article aims at describing the behavioral risk factors of NCDs among the population residing in Abha area and determining the association between behavioral risk factors.

2.2. Population under Study. The population of the city is about half a million. In this study, we consider the

population more than or equal to 18 years of age visiting primary healthcare centers at any time for any purpose.

2.3. Sample Population. During the literature review, we did not find any study which has reported the prevalence of the residents visiting PHCs of their area. We conducted a small survey by selecting 100 persons randomly and found that 27 individuals from the age of 18 to 71 years visited PHCs. Taking prevalence of 27% with a margin of error of 0.10% and the level of significance 5%, we include 1070 samples in our study.

2.4. Inclusion Criteria. The inclusion criterion for the study was that of an adult population of age more than or equal to 18 years visiting PHC in their respective areas for any purpose and apparently healthy and willing to participate in the study.

2.5. Exclusion Criteria. The exclusion criteria for the study were that of persons less than 18 years of age, females who were pregnant, psychiatric patients, severely ill, and those who rejected to participate in the study.

2.6. Sampling Procedure. In Abha district, the total number of PHCs is 46 out of which 12 are in urban and 34 are in rural areas. The ratio of urban to rural is approximately 1 : 3. We randomly selected 2 PHCs from urban and 6 PHCs from rural areas by using lottery method, and then from each PHC, researcher selected samples as per the population ratio of each PHC using stratified sampling comprising of 1,070 subjects. The probability proportional to size sampling procedure has been adopted to meet the feasible acceptance of the results.

2.7. Allocations of Samples to Different Strata/Blocks. In the present study, we estimated the proportion by stratified sampling. We allocated the samples in different strata in each block as per proportional allocation. We took the average of the total number of registrations of patients of the weeks of the last five months of the year 2018.

2.8. Study Tool. A standardized pretested, structured questionnaire consists of the sociodemographic particulars and details regarding behavioral risk factors for non-communicable disease.

2.9. Behavioral Risk Factors

Tobacco users were defined as individuals who had the habit of using any form of tobacco/shisha

Physical activity: low physical activity was defined as <150 minutes of moderate physical activity per week or no activity at all

An unhealthy diet is the low consumption of fruits and vegetables at less than five servings per day

Fast food consumption was defined as an individual consuming fast foods thrice or more per week

Skipping meal included individuals who had a habit of skipping meals routinely or at least 5 times per week

Inadequate sleeping included individuals sleeping less than 8 hours per day routinely

2.10. Data Collection. The study used a pretested structured questionnaire which was conducted by using the modified WHO NCD STEPS approach I instrument version 2.2 (WHO (2014)). The protocol was based on the WHO STEPS approach. Information on sociodemographic variables and behavioral risk factors, such as tobacco use, physical exercise, diet pattern, consumption of fast food, skipping routine meals, and inadequate sleep was collected by using a pro forma translated in Arabic language to ensure that all respondents understood each and every question.

The selected subjects were briefed about the study, and proper consent in a written format (enclosed with the questionnaire) was obtained from them.

All the questions which have been considered were adequately reliable with Cronbach's alpha of 0.767. The primary information was collected (May to September 2018) from 1070 participants who visited eight selected PHCs in two areas of district Abha: Asir, KSA.

2.11. Data Analysis. The responses were collected and counted manually based on the options specified for each question framed. Files on each participant (questionnaire) were then merged using the participant identity number crosschecked with participant name and identification number. After merging, common variables in the dataset were matched and inconsistencies were corrected. All the data collected were entered into Microsoft Excel. Data cleaning and analysis was done using SPSS 25 version. The prevalence of NCD risk factors has been presented in the form of frequencies and percentages. Most of the variables in this study are categorical. Statistical significance (chi-square test and *P* value) and strength of association (odds ratio and 95% confidence interval) were tested between behavioral risk factors.

3. Results

A total of 1070 subjects took part in the study. The population consists of rural ($n = 677$) and urban patients ($n = 393$) visiting PHCs. The female and male percentages were found to be 36% and 64% and 41% and 59% among rural and urban subjects, respectively. It denotes the greater participation of males from rural as well as urban areas and thus the utilization of PHC services as well.

The highest number of patients was found in the age group of 26 to 40 years (42% ($n = 291$) and 57% ($n = 224$) in the rural and urban subjects, respectively), while the least number of patients was found in the age group of more than 60 years (13% ($n = 86$) and 6% ($n = 24$) in the rural and urban areas, respectively). It shows that old age people who

are more than 60 years are availing least services of PHCs in comparison with the younger people. The reason might be the lack of mobility and self-dependence among older people.

Among rural subjects, the maximum number of patients ($n = 252$, 37%) was educated up to secondary level, while 12% ($n = 83$) were found to be not literate at all. On the other hand, maximum number of patients ($n = 246$, 63%) from the urban area was university graduates, and only 2% ($n = 8$) were found to be not eligible to read and write at all. It denotes the higher literacy rate among urban subjects than rural patients.

The maximum number of subjects in a rural area ($n = 353$, 52%) was married while 3% ($n = 21$) were divorced. Similarly, 59% ($n = 230$) were married in an urban area while 10% ($n = 38$) were found to be divorced.

The maximum ($n = 255$, 38%) were unemployed in a rural area while 37% ($n = 251$) were having income less than 7000 SAR/month. Among urban subjects, the maximum ($n = 156$, 40%) had income between 7000 and 15000 SAR/month and 26% ($n = 104$) were unemployed. It denotes the better economic condition among urban subjects which might be the reason for higher health-seeking behavior (Table 1).

Maximum number of patients ($n = 202$, 30) had complaints of cardiovascular diseases (CVD), which include stroke, angina, coronary artery diseases, and so on followed by respiratory diseases ($n = 156$, 23%). Diabetes and cancer had been reported by ($n = 21$) 3% and ($n = 2$) 0.29%, respectively. Among urban subjects, maximum number of patients ($n = 158$, 40%) had a complaint of CVD followed by respiratory diseases ($n = 59$, 15%) while diabetes and cancer had been reported by ($n = 27$) 7% and ($n = 9$) 2% of subjects. It shows the sizeable prevalence of CVD among rural as well as urban populations followed by respiratory diseases, diabetes, and cancer with a greater share among the urban population. It also warrants the designing and implementation of the strategies for prevention, early diagnosis, and better management of noncommunicable diseases among rural as well as urban population (Figure 1).

Smoking habit was more prevalent among urban patients ($n = 214$, 54%) in comparison with their rural counterparts ($n = 324$, 48%). Majority of rural patients were found to be physically inactive as ($n = 278$) 40% of patients accepted to exercise occasionally while urban subjects were found to be the most active as ($n = 113$) 29% accepted to exercise daily. Majority of patients from rural ($n = 425$, 63%) as well as the urban areas ($n = 350$, 89%) accepted to have food at home. Majority of subjects from both the areas accepted to have 3 meals a day. Most of the rural ($n = 418$, 62%) and urban subjects ($n = 268$, 68%) reported to have a fondness for fast food. Majority of rural ($n = 653$, 96%) as well as urban subjects ($n = 282$, 72%) accepted to have a sleep pattern of less than 8 hours daily, which is not a good sign in terms of a healthy lifestyle. 35% ($n = 240$) and 34% ($n = 228$) of rural subjects reported taking canned juice and soft drinks, respectively, while 38% ($n = 150$) and 37% ($n = 147$) of urban subjects accepted taking fresh juice and soft drinks daily (Table 2).

TABLE 1: Sociodemographic characteristics of the studied population.

Parameter	Area		Total (<i>n</i> = 1070)	
	Rural (<i>n</i> 1 = 677)	%		
Gender				
Female	245	36	160	41
Male	432	64	233	59
Age group				
<25	120	18	62	16
26–40	291	42	224	57
41–60	180	27	83	21
>61	86	13	24	6
Education level				
Illiterate	83	12	8	2
Primary	155	23	56	14
Middle	115	17	16	4
Secondary	252	37	67	17
University	72	11	246	63
Marital status				
Divorced	21	3	38	10
Married	353	52	230	59
Single	303	45	125	32
Monthly income				
<7000	251	37	133	34
7000–15000	171	25	156	40
No income	255	38	104	26
Employment status				
Employed	422	62	289	74
Not employed	255	38	104	26

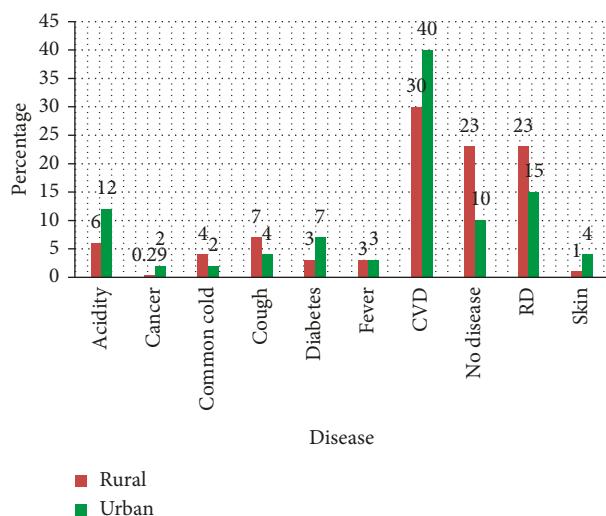


FIGURE 1: Prevalence of the disease among the population to visit PHCs.

The magnitude of various behavioral risk factors was analysed and is represented in odds ratios and confidence intervals. Further, the linkage between common risk factors versus pathophysiological risk factors such as obesity, cardiovascular disease, and respiratory disorders was established in order to find independent associations. Consumption of fast food was a significant risk factor for all three conditions: odds ratio (OR) = 2.72 and 95% CI [1.50, 4.92] for obesity, OR = 1.52 and 95% CI [1.20, 1.94] for CVD,

and OR = 2.13 and 95% CI [1.58, 2.86] for respiratory disease. There were no significant associations between sleep hours and obesity. However, obesity was significantly associated with consumption of fast food (OR = 2.72, 95% CI [1.50, 4.92]) and diet pattern (OR = 4.34, 95% CI [2.19, 8.60]). Smoking (OR = 0.76, 95% CI [0.42, 1.37]) had opposite effect on obesity compared to nonsmokers (OR = 2.78, 95% CI [0.98, 7.82]).

Table 3 shows multivariate analysis of risk factors associated with CVD. There were significant associations between CVD and smoking (OR = 0.69, 95% CI [0.54, 0.88]). This habit is more dangerous as it damages the lining of the smoker's arteries. Diet pattern (OR = 1.86, 95% CI [1.44, 2.39]) and fast food (OR = 1.52, 95% CI [1.20, 1.94]) have also good impact on developing CVD. We did not find any association between sleeping hours and CVD (OR = 0.57, 95% CI [0.42, 0.79]).

Table 4 shows behavioral analysis risk factors associated with RD.

RD showed significant associations with smoking (OR = 0.22, 95% CI [0.15, 0.32]) and less physical activity (OR = 0.53, 95% CI [0.38, 0.73]). Fast food consumption and more sleeping hours are significantly associated with RD ((OR = 2.13, 95% CI [1.58, 2.86]) and (OR = 0.33, 95% CI [0.23, 0.46]), respectively) (Tables 3–5).

4. Discussion

The Saudi population is growing rapidly due to the high birth rate/life expectancy and low infant mortality rate [8].

TABLE 2: Behavioral attitude of the studied population in comparison with their respective areas.

Variables	Area				Total	Chi-square; significance
	Rural (<i>n</i> = 677)	%	Urban (<i>n</i> = 393)	%		
Smoking habit						
No	353	52	179	46	532	4.3258; <i>P</i> < 0.05
Yes	324	48	214	54	538	
Physical activity						
Daily	53	8	113	29	166	141.2; <i>P</i> < 0.05
Every alternate day	19	3	31	8	50	
Occasionally	278	41	56	14	334	
Do not exercise	327	48	193	49	520	
Routine meals						
Home	603	89	290	74	893	42.0457; <i>P</i> < 0.05
Restaurant	74	11	103	26	177	
How many times do you eat daily						
2 times	188	24	120	30	308	224.85; <i>P</i> < 0.05
3 times	309	45	177	45	486	
4 times	180	27	88	22	268	
More than 4	0	0	8	2	8	
Do you like fast food						
No	259	38	125	32	384	4.4966; <i>P</i> < 0.05
Yes	418	62	268	68	686	
Sleep daily						
=8 hours	24	4	111	28	135	165.83; <i>P</i> < 0.05
<8 hours	653	96	282	72	935	
What drink do you take daily						
Canned juices	240	35	72	18	312	87.1209; <i>P</i> < 0.05
Energy drink	96	14	24	6	120	
Fresh juices	113	17	150	38	263	
Soft drink	228	34	147	37	375	

TABLE 3: Association between behavioral risk factors and cardiovascular disease.

Risk factors	Behavior	Total participants (<i>n</i> = 1070) (%)	CVD frequency (<i>n</i> = 360) (%)	Odds ratio	95% CI	Chi-square value	P value
Smoking habit	Yes	538 (50.28)	213 (59.16)	0.6979	0.54–0.88	8.5301	0.003493
	No	532 (49.72)	147 (40.83)				
Physical activity	Yes	216 (20.18)	51 (14.16)	1.5324	1.09–2.13	6.42	0.01122
	No	854 (79.82)	309 (85.84)				
Diet pattern	Adequate	793 (74.11)	218 (60.55)	1.8648	1.44–2.39	23.89	0.0001
	Inadequate	277 (25.89)	142 (39.45)				
Routine meals	3 times	603 (56.35)	254 (70.55)	0.8490	0.67–1.06	22.61	0.001
	Skipping meals	467 (43.65)	106 (29.45)				
Consumption of fast food	Yes	686 (64.11)	194 (53.89)	1.5286	1.20–1.94	11.89	0.0005
	No	384 (35.89)	166 (46.11)				
Sleep hours	=8 hours	135 (12.61)	72 (20)	0.5775	0.42–0.79	11.86	0.0005
	<8 hours	935 (87.39)	288 (80)				

Saudi population will be 39.8 million in 2025. This high population growth has demanding feedback on healthcare services and facilities. The Saudi community has been positively affected in their income [9], and the country was ranked 0.75 in Human Development Index, becoming 55th in 194 countries, which has led to better services that included healthcare. Approximately 80% of the Saudi health services are government-funded and provided free of charge to the whole population [10].

NCD is the largest contributor to the disease burden, and its prevalence is expected to continue to rise [3]. It is because

of the consequence of the changing patterns of disease from communicable to noncommunicable diseases [11]. There is an alarming increase in cardiovascular, chronic respiratory diseases, diabetes, and cancer, and it accounts for 78% of all mortality [2, 6, 12].

Our study aims at providing a commencement of NCD risk indicators in Asir region. Overall cardiovascular disease has been highest among NCDs. Prevalence is higher in urban than in rural areas. On the other hand, respiratory disease is higher in rural than in urban areas. There is a sizeable deviation between the areas due to demographic and

TABLE 4: Association between behavioral risk factors and respiratory disease.

Risk factors	Behavior	Total participants (n = 1070) (%)	RD frequency (n = 215) (%)	Odds ratio	95% CI	Chi-square value	P value
Smoking habit	Yes	538 (50.28)	176 (81.86)	0.2241	0.15–0.32	72.3132	0.0001
	No	532 (49.72)	39 (18.14)				
Physical activity	Yes	216 (20.18)	69 (32.1)	0.5352	0.38–0.73	14.7035	0.0001
	No	854 (79.82)	146 (67.9)				
Diet pattern	Adequate	793 (74.11)	168 (78.13)	0.8009	0.56–1.13	1.5399	0.2146
	Inadequate	277 (25.89)	47 (28.87)				
	3 times	603 (56.35)	123 (57.2)				
Routine meals	Skipping meals	467 (43.65)	92 (42.8)	0.9658	0.71–1.29	0.0531	0.817
Consumption of fast food	Yes	686 (64.11)	98 (45.6)	2.1328	1.58–2.86	25.84	0.0001
	No	384 (35.89)	117 (54.4)				
Sleep hours	=8 hours	135 (12.61)	67 (31.16)	0.3319	0.23–0.46	43.477	0.0001
	<8 hours	935 (87.39)	154 (68.84)				

TABLE 5: Association between behavioral risk factors and obesity.

Risk factors	Behavior	Total participants (n = 1070) (%)	Obesity frequency (n = 48) (%)	Odds ratio	95% CI	Chi-square value	P value
Smoking habit	Yes	538 (50.28)	27 (56.25)	0.7691	0.43–1.38	0.7835	0.376
	No	532 (49.72)	21 (43.75)				
Physical activity	Yes	216 (20.18)	4 (8.3)	2.7822	0.99–7.83	4.0838	0.0432
	No	854 (79.82)	44 (91.7)				
Diet pattern	Adequate	793 (74.11)	17 (35.41)	5.22	2.90–9.60	34.46	0.001
	Inadequate	277 (25.89)	31 (64.59)				
	3 times	603 (56.35)	11 (22.91)				
Routine meals	Skipping meals	467 (43.65)	37 (77.09)	4.3432	2.19 –8.60	20.74	0.001
Consumption of fast food	Yes	686 (64.11)	19 (39.58)	2.7267	1.50–4.92	11.86	0.0005
	No	384 (35.89)	29 (60.42)				
Sleep hours	=8 hours	135 (12.61)	7 (14.58)	0.8457	0.37–1.92	0.1602	0.688
	<8 hours	935 (87.39)	41 (85.42)				

socioeconomic contrast. Also it has been observed that low wages and unemployment have a direct impact on the development of NCDs. There are various other studies which endorsed our observations. When comparing to an earlier study [6, 12, 13], we find evidence of an increase in some NCDs. The study indicates that the urban population is more prone to developing CVD and diabetes. The most prevalent factors are low physical activity, unhealthy dietary pattern, skipping meals, consumption of fast food, and inadequate sleeping. These factors are more common in the urban population. Respiratory disease is a very alarming sign in this area because of high altitude, wind movement, and changes in temperature.

Our findings confirm that smoking habits are slightly higher in urban than in rural areas. It is an established fact that smoking is the reason for growing CVD, respiratory disease, and other NCDs. In the kingdom, cigarette prices are higher than in other GCC countries. Since January 2017, the excise duty, commonly known as a “sin tax,” is imposed on unhealthy products. This work describes that there is no consequential decrease in the frequency of smoking even after the increase in tobacco rates. It is a well-established fact that tobacco use is the most common cause of non-communicable diseases. By 2020, WHO assesses that

tobacco will be the reason for 7.5 million deaths per annum or it approximates one in per ten mortality rates [2]. Smoking use is the common risk factor among the four main groups of NCDs—cardiovascular disease, chronic respiratory disease, diabetes, and cancer. It is also an established risk indicator of communicable diseases such as tuberculosis, bronchitis, and lower respiratory tract infections—health hazards that plague humanity.

Majority of the studied subjects (more than half) reported being physically inactive. Besides men and women, the young generation was more physically inactive. People rarely go for jogging or simply walk. Saudi Arabia’s economic transition has changed conventional state and vocational customary behavior to the affliction of physical inactivity [6, 13].

The provision of diet prevailing in developed countries is characterized by high utilization of sifted grains, mutton, desserts, sweets, French fries, and high-fat dairy products [5, 14]. Harmful patterns of food intake have a direct strong relation with metabolic changes. This pattern is a significant reason for the incidence of noncommunicable diseases (NCDs). It has also been associated conclusively with an increased frequency of respiratory disease [2]. Further, a vital incitement with fast food meals has been reported to

aggravate air-shaft inflammation. There are a number of research studies which reported that the “Western” diet is directly related to an increased risk of respiratory disease [5].

Skipping meals is also a problem in the population. It has been found that twenty-four percent in rural and thirty percent in the urban population are skipping at least one meal mostly breakfast per day. The main reason for skipping breakfast was related to inadequate sleep. We found that more frequent breakfast skipping was associated with greater odds of being overweight. This behavior was reported mostly in young people. This gives rise to the growth of NCDs among the population [12, 15]. Most of the studies endorse that cardiovascular risk factors are physical inactivity, smoking, high blood pressure, and high serum total cholesterol [16].

Consumption of processed fast food continued to increase swiftly in the kingdom. This sustenance adaptation affects dietary patterns and nutrition intake, which increase the likelihood of spreading NCDs. It has been found that the persons among the population who remain out most of the time from home incline to contemplate ease, accessible, and approach of eating as an important factor in fulfilling their food and energy requirements. This situation may lead to an imbalance in their health status and risk of diet-related noncommunicable diseases (NCDs) [17].

There is sufficient evidence of an association between fast food and diabetes [17]. It has been reported that the Saudi population shows affection for pastry desserts, creamed sandwiches, French fries, and fast foods. This behavior increases the risk factors for noncommunicable diseases among the population as there are a number of studies that reported the association between fast food consumption and increase in body mass index which results in obesity, cardiovascular disease, and so on. The other major challenging area of consumption of fast food is energy drinks and carbonated soft drinks that results in the production of immoderately refined sugar which can also lead to obesity and hence added to the risk factors of NCDs [14, 18].

Adequate sleeping is as important as a balanced diet and physical activity. It is incredibly essential for our health. Most of the experts declare that one should get at least seven hours of sleep each night. Unfortunately, the present behavioral environment intervenes in the natural sleep pattern. Most of the persons, particularly adult populations, are now sleeping less than they require. The quality of sleeping has been decreased which results in inefficient concentration towards work or physical activity and towards eating adequate meals. It has been reported that poor sleep leads to an increase in weight significantly more than those persons who get adequate sleep. There are many risk factors caused by this behavior which cause heart disease and stroke. It also affects glucose metabolism, depression, and type 2 diabetes. There is a strong direct relationship between inadequate sleep and the long-term inflammation of the digestive system. This behavior is a silent indicator for an increasing frequency of noncommunicable disease. Besides the intervention of established risk factors, the public health and educational institutes should lay stress on the importance of adequate

sleep, health hazards of consumption of fast food, carbonated soft drinks, and skipping meals.

5. Conclusion

There is strong evidence of unusual lifestyle-related behaviors among the population. This is the reason for the increasing prevalence of noncommunicable diseases and subsequent unwanted economic burden. Prevention can happen by the use of every means available including media, counseling, and social activities, and such actions should be replicated to address the behavioral attitude among the population at global, regional, and national levels.

Data Availability

All data supporting this study are provided as supplementary information accompanying this paper in Excel format.

Additional Points

Contribution of the Study. The findings of the present study are of inestimable worth to support advocacy of the modified risk indicators for the increasing magnitude of non-communicable disease. This research work delivers the first and most comprehensive evidence linking behavioral risk factors with increased occurrence of noncommunicable diseases in the region. Therefore, it is important to address the impacts of these behavioral habits and health hazards. It is an essential requirement to provide suitable measures combined with stronger and sustainable plans to change these behaviors and their use. *Limitation of the Study.* The study has been conducted in the specific primary health centers of Asir region.

Ethical Approval

Ethical clearance has been obtained from the Directorate of Health Services—Asir region.

Conflicts of Interest

The authors have no conflicts of interest to declare.

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Research Article

Factors Determining Work Arduousness Levels among Nurses: Using the Example of Surgical, Medical Treatment, and Emergency Wards

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Guest Editor: Nicola Mucci

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Introduction. Staff shortages among nurses have been severely felt in most countries around the world for many years. In Poland, this problem is particularly visible due to the lowest nursing employment rate per 1000 inhabitants among 28 EU states and the high rate of leaving the profession. The average age of Polish nurses has been constantly growing for several years—in 2016 it was 50.79, while in 2008 it was 44.19. These data confirm that young nurses are the first to leave the profession. Diagnosis of the working conditions and psychosocial burden level among nurses should be subject to detailed analysis, so that leaving the profession will not additionally deepen the difficult staffing situation in health care. **Aim.** The aim of the study was to identify factors affecting the assessment of work arduousness levels among nursing personnel. **Materials and Methods.** The study was conducted among 573 nurses working on surgical, medical treatment, and emergency wards. A standardized job evaluation questionnaire was used to conduct the survey. **Results.** (1) Stress levels depended on the ward in which the surveyed person worked. Nurses working in the emergency ward assessed their conditions the best, with the lowest stress. The average general result in this group was 38.1 points versus 46 and 45.7 points in the surgical and medical treatment wards, respectively. (2) At the level of the whole studied group, both the nurses' age and work experience did not differ statistically significantly in the total assessment of working conditions. Differences in the assessment of work arduousness in different age categories occurred at the level of individual wards. In the surgical ward, younger employees were characterized by higher stress levels, especially in the area of arduousness ($p = 0.0165$). In the medical treatment wards, there was a similar age-to-stress ratio for the area of organizational uncertainty ($p = 0.0063$). With age, employees of the emergency ward became more indifferent to stress related to unpleasant working conditions ($p = 0.0009$), while stress related to organizational uncertainty increased ($p = 0.0495$). (3) Nurses working in managerial positions assessed the overall stress related to their job higher than other nurses. They were particularly at risk for burdens related to haste, responsibility, and organizational uncertainty. The average overall assessment of work arduousness for this group was 44.6 points, while for surgical nurses it was 37.2 points. Correlations between the performed function and stress levels were found for almost all of the studied work characteristics (except for hazards). (4) Education had a statistically significant impact on the perception of working conditions in several dimensions. The people with the lowest education evaluated working conditions the best. The difference between people with a higher and those with a secondary education with a specialization was definitely smaller and often nonexistent. Education differentiated the work arduousness assessment depending on the ward. The most statistically significant correlations were obtained in surgical wards, and the least in medical treatment wards. **Conclusions.** (1) The study results indicate the need to diagnose problems related to work conditions in the context of occupational stress within individual hospital wards. To limit employee turnover, nursing staff managers should approach the issue of improving working conditions individually for each ward, due to differences in the nature of the work and level of stressogenicity. (2) In each hospital ward, employees at different stages of their career are sensitive to the psychosocial burden resulting from different work characteristics. These areas should be thoroughly diagnosed and the burden minimized to prevent departures from the profession—at early stages of the professional career as well as among experienced personnel. (3) Nurses working in managerial positions should receive the necessary substantive support, due to the higher stress burden associated with greater responsibility.

1. Introduction

Staff shortages among nurses have been severely felt in most countries around the world for many years. In Poland, this problem is particularly visible due to the lowest nursing employment rate per 1000 inhabitants among 28 EU states, which in 2015 was merely 5.2. In comparison, in Denmark, it was 16.7, in Germany 13.3, and in France 9.9, while the average for 35 OECD member countries was 9.0 [1].

Research by the Supreme Council of Nurses and Midwives indicates that the shortage of nurses in Poland is much higher than the available studies show. This is due to the fact that the established minimum employment standards are based on the basis of registered health services, taking into account the number of beds, the specificity of the ward, and not the actual needs of the medical facility. The result is one nurse working the night shift or less personnel on Sundays and holidays. This translates into a greater workload due to the increased number of responsibilities per person [2].

Another unfavorable phenomenon observed in this professional group in Poland is the gradual increase in the average age of registered nurses. In 2008, it was 44.19, while in 2016 it was 50.79, which means a rise by 6.6 years in only 8 years. The majority of registered nurses were in the 41–60 age group (66.51%), while nurses in the youngest age group from 21 to 35 constituted only 5.53% of all registered nurses [3].

The successive increase in the average age of nurses and the declining percentage of nurses in the youngest age group may indicate several phenomena, including lack of employment of new nurses in the profession despite obtained qualifications, financially motivated emigration after graduation, as well as leaving the profession early in the career and retraining to work in another profession. The scientific literature has identified a number of factors that are the most frequent reasons for nurses leaving the profession [4–8]. They include factors such as low wages, few career development opportunities, shift work, health problems, and the psychosocial burden in the workplace.

Psychosocial burden, in the case of nurses, concerns, among others, overloading with physical work, fears of infection with diseases, work complexity, the ambiguity of the role played in the organization, unpleasant working conditions, conflicts, employment insecurity, and negative family relations resulting from a work-home conflict. Excessive workload is compounded by the fact that in Poland, as in many other countries in the world, this profession is strongly feminized. As a result, there is no possibility that particularly physically burdensome work, such as lifting patients, for example, can be performed by physically stronger men. In addition, nursing aids, who could perform nursing activities around the patient, are not employed in Poland. Therefore, in addition to providing medical care, nurses perform a number of activities, such as patient hygiene and washing, change of bed linens, transporting patients for tests, and other activities [9]. The high physical burden and resulting fatigue additionally intensify stress, the

fear of making a mistake, which in the case of nurses can have far-reaching consequences (giving the patient the wrong dose of a drug, for example). Furthermore, the nature of the work causes a rise in the number of factors that are hazardous to nurses' health, including those that require lifting, walking with a heavy load, and taking a forced body position. [10, 11].

The complexity of work in the case of nurses is first and foremost the necessity to perform many activities requiring attention and accuracy, such as administering the right doses of medicines, carrying out measurements (e.g., blood pressure), handling medical devices that are interlaced with hard physical work. A significant source of stress is conflict at the workplace, which include conflicts with other nurses and superiors, including frequent cases of bullying [12, 13].

The health problems of nurses often originate in psychosocial burdens at the workplace. This is confirmed by numerous scientific studies on the general impact of stress on the physical and mental health of employees as well as in detailed research, e.g., confirming the unequivocally negative impact of bullying on psychoemotional aspects of a nurse's health, and indirectly as one of the factors causing burnout on the general health condition of nurses [14].

In this study, we attempted to identify the most arduous and most frequently occurring burdens at the workplace of nursing personnel. Using statistical analysis, we diagnosed the effect of particular factors, such as age, duration of professional experience, and position held, on the intensity of psychosocial burden perception and compared the differences in the work arduousness assessment depending on the respondent's place of work, that is, the ward where he/she worked.

2. Materials and Methods

The study was conducted from September 2017 to December 2017 in Poland in the Podlaskie Voivodeship. It included 573 people working as nurses at inpatient health care facilities. Participation in the study was voluntary and anonymous. Participants could quit the survey at any level. All procedures were prepared according to the ethics standard approved by the Local Bioethics Committee of the Medical University of Białystok (ref. no R-I 002/296/2017).

2.1. Study Procedure. The study was conducted by a group of experts composed of representatives of nurses and teachers in the nursing profession. These people understood the purpose of the study and knew the specificity of working as a unit nurse at inpatient health care facilities. The study was conducted using a standardized Work Features Assessment Questionnaire developed by Dudek et al. [15]. The questionnaire was developed by a team of Polish researchers and therefore it was considered the best suited tool to the specifics of the studied population. The experts thoroughly explained the purpose and meaning of the individual questions to the study participants and then filled out the

questionnaire themselves based on the respondents' responses and observations. This way of conducting the study provided an objective assessment of work stressfulness. "Objectivity" in this case means that the assessment was not dependent on the individual stress experienced by the respondent and is a resultant of assessments made independently by 2-3 experts familiar with the specificity and working conditions at a given position.

2.2. Study Group Selection. The selection of respondents to the research group was based on the register of nurses associated with the District Chamber of Nurses and Midwives in Białystok. The criterion was employment based on a contract of employment at a hospital in medical treatment, surgical, or emergency units. 10% of randomly selected persons meeting the selection criterion were invited to the study.

2.3. Description of the Questionnaire and the Applied Measures. A standardized Work Features Assessment Questionnaire for objective assessment of work stressfulness was used as a research tool [15]. The questionnaire consisted of 34 statements describing particular work features. These statements were rated on a scale of 1 to 5 depending on the feature's frequency, duration, or severity.

Based on the statements of the questionnaire, 10 specific measures were determined: unpleasant working conditions, work complexity, hazards, conflicts, uncertainty resulting from the organization of work, arduousness, haste, responsibility, physical effort, competition, and one overall measure of work arduousness. The higher the score, the higher the work arduousness in a given aspect. The results for the individual measures are not comparable with each other, because each individual measure (and overall measure) has a different number of component statements. To allow for comparison between work arduousness estimations in different categories, raw values of the individual measures were normalized to a range of 0–100, with 0 indicating the absence of work arduousness and 100 indicating the maximum work arduousness.

Based on the standards set out in the questionnaire, individuals with high stress levels due to work arduousness in the different areas were distinguished. In the case of the overall scale of work arduousness, three categories were distinguished: low, medium, and high.

2.4. Statistical Methods. Statistical analysis was performed using the appropriate statistical tests, by means of which the statistical significance of the considered dependencies was verified. In the case of studying the effect of a nominal factor (such as the ward) on work arduousness numerical values, descriptive statistics were determined in the compared groups and differences in the distribution of the measures between the groups were assessed using the Mann–Whitney test (for two groups) or the Kruskal–Wallis test (for three or more compared groups). When studying the effect of a numerical feature (e.g., age or work experience) on work arduousness

numerical values, Spearman's rank correlation analysis was used. The percentage of people with a high level of work arduousness in particular professional areas relative to the grouping factor was compared using the chi-square test.

3. Results

The study included 573 respondents working as nurses. The vast majority of the respondents were women (97%). The average age for the studied group was 38.5 years, with a slightly higher median equal to 39 years. The youngest employee was 21 years old and the oldest was 61. Over half of the respondents had completed nursing studies, one-fourth had a secondary education with a specialization, and one-fifth had secondary education. The average duration of work experience was 15 years, with a slightly lower median of 14 years. Work experience ranged from one to 41 years. The majority (3/4 of the respondents) worked as a unit nurse. Every tenth nurse was employed as a surgical nurse, and every twentieth held a managerial position. The percentage distribution of employees between wards (surgical, medical treatment, emergency) was almost even.

On the basis of the obtained results, a ranking of work arduousness measures, presented in Figure 1, was prepared. The elements of work such as hazards, work complexity, and haste were defined as the most arduous, and the least problems occurred in such categories as conflicts or competition.

Next, based on the standards set out in the questionnaire [12], individuals with high stress levels due to work arduousness in the different areas were distinguished, which allowed determining the burden intensity of particular elements of work. The ranking of the elements of work in terms of frequency of occurrence to a degree causing high stress levels is shown in Figure 2. Most often, high levels of stress were caused by work complexity, unpleasant working conditions, and haste, and the least often by arduousness and responsibility.

In the case of the overall scale of work arduousness, three categories were distinguished: low, medium, and high. According to such a classification, more than two-thirds of the respondents considered their work to be very arduous, and only one in twenty to be easy.

The work arduousness values were compared in terms of the ward on which the respondents worked. The results of the comparison lead to an unambiguous conclusion about the significant impact of this factor on work assessment. For all areas in which work arduousness was assessed, the differences between wards were statistically significant. Considering the total work arduousness levels, the emergency ward stood out (the average level for the general result in this group was 38.1 points versus 46 and 45.7 points for surgical and medical treatment wards, respectively). Detailed data are presented in Table 1, which shows that the emergency ward was characterized by the lowest stress levels in all areas. In all wards, such features as hazards, haste, and work complexity were rated as the most arduous, whereas competition, conflicts, and unpleasant working conditions as the least arduous.

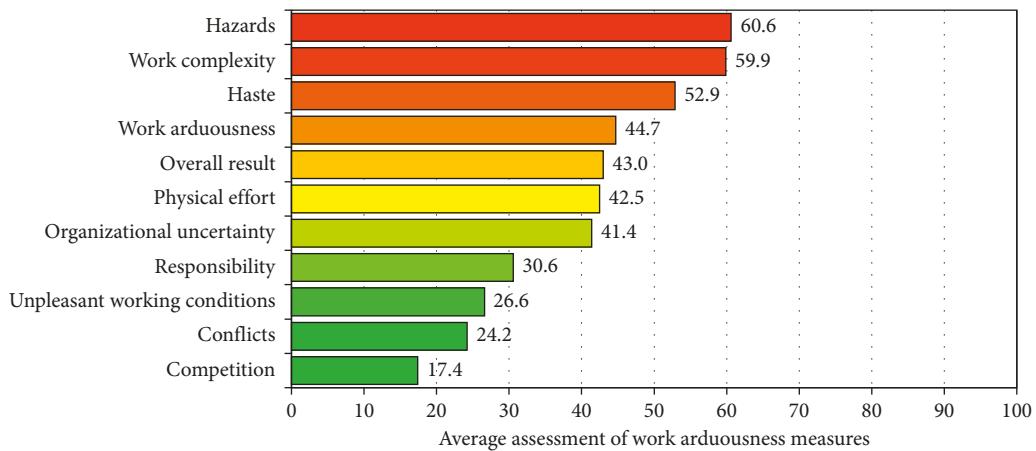


FIGURE 1: Ranking of work arduousness measures.

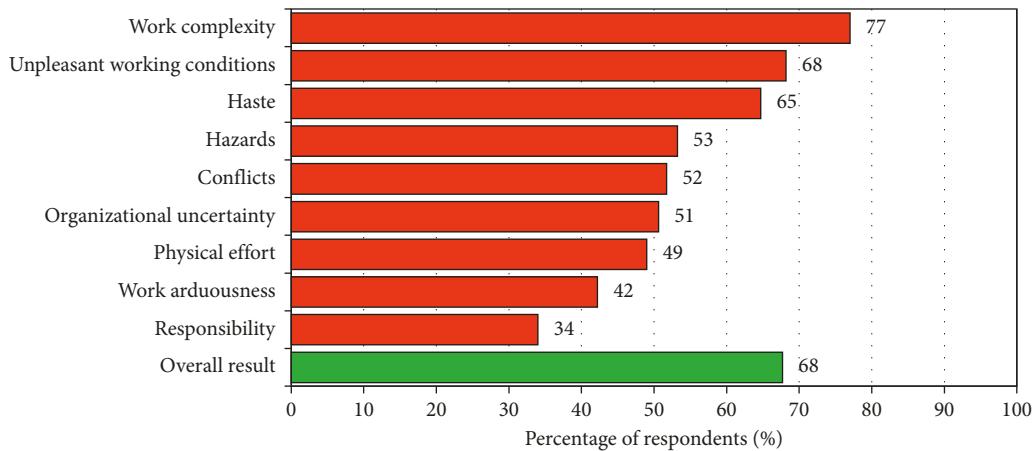


FIGURE 2: Ranking of work arduousness in terms of frequency of occurrence.

TABLE 1: Work arduousness values on the wards.

Work features assessment (0–100 pts)	Ward									<i>p</i>
	\bar{x}	Me	s	\bar{x}	Me	s	\bar{x}	Me	s	
Unpleasant working conditions	31.7	30.0	17.0	23.4	15.0	21.6	24.5	25.0	12.7	$\leq 0.001^{***}$
Work complexity	60.3	62.5	16.2	63.8	66.7	16.9	56.3	58.3	14.4	$\leq 0.001^{***}$
Hazards	67.3	70.0	17.5	61.3	65.0	19.3	53.9	55.0	14.1	$\leq 0.001^{***}$
Conflicts	22.5	18.8	16.3	30.2	25.0	19.5	20.8	18.8	13.8	$\leq 0.001^{***}$
Organizational uncertainty	45.1	37.5	26.2	47.7	50.0	28.0	33.0	31.3	21.2	$\leq 0.001^{***}$
Work arduousness	51.8	50.0	18.5	44.7	41.7	20.3	38.3	41.7	16.7	$\leq 0.001^{***}$
Haste	57.2	62.5	25.5	56.5	62.5	23.5	46.0	50.0	21.1	$\leq 0.001^{***}$
Responsibility	31.9	25.0	33.3	37.0	37.5	28.6	24.4	12.5	23.4	0.0002^{**}
Physical effort	42.6	50.0	19.2	44.9	50.0	18.4	40.5	37.5	15.3	0.0217^*
Competition	16.0	0.0	28.3	25.1	0.0	34.0	12.3	0.0	21.7	0.0025^{**}
Overall result	46.0	44.9	12.4	45.7	45.6	13.8	38.1	36.0	9.8	$\leq 0.001^{***}$

p value of statistical significance calculated using the Kruskal-Wallis test.

Figure 3, a box and whisker plot, shows the median level, the values of the 25th and 75th, as well as the 10th and 90th centile of work arduousness measures for the overall result and the hazards measure (selected as an example from the other measures).

The relationship between the ward and work arduousness occurrence was also compared in terms of the incidence of people who felt high burden levels in individual areas. In this analytical approach, we also found highly statistically significant differences between the wards for almost all the

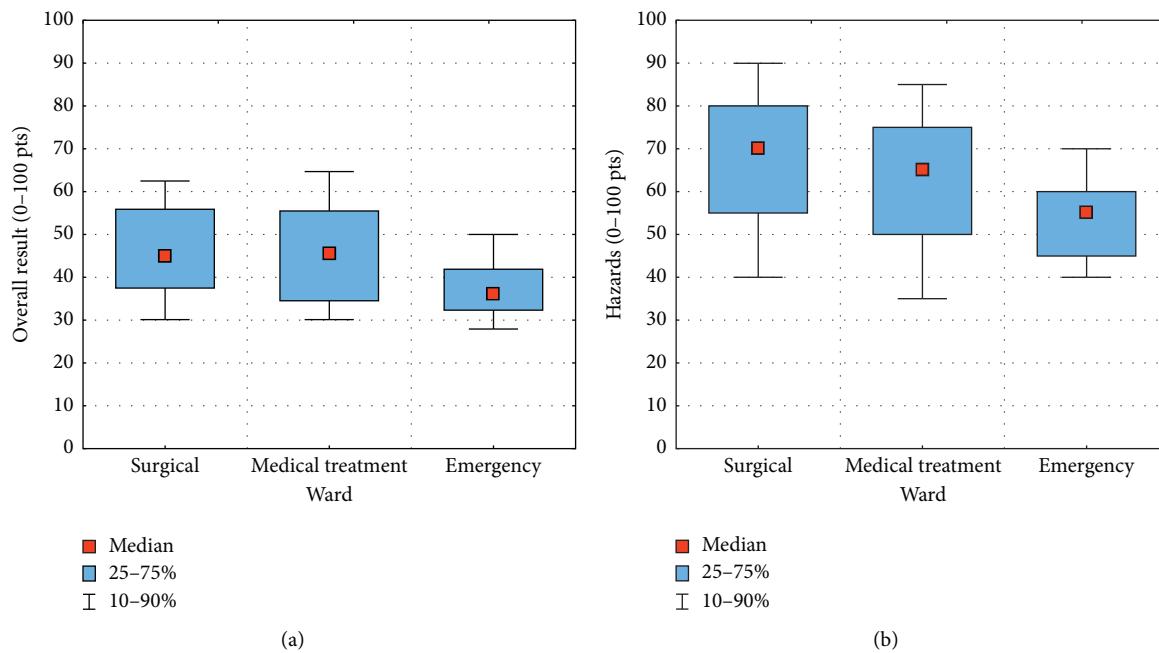


FIGURE 3: Median, quartiles, and centiles for overall results and hazards.

considered areas (with the exception of the work complexity category). Analyzing the results in Table 2 in detail, it can be stated that the smallest percentage of people experiencing high work arduousness occurred in the emergency ward and the largest in the surgical ward. The most intense on all wards were features such as haste, unpleasant working conditions, conflicts, and organizational uncertainty. Additionally, organizational uncertainty occurred most frequently in the case of medical treatment wards and hazards in the case of surgical wards. The least intense were responsibility and work arduousness and physical effort, only in the case of surgical wards.

Analysis of the variation of work arduousness assessments in terms of the wards ends with a list of adjective distribution of the arduousness scale in the compared groups, listed in Table 3. Differences in the assessment of stressful situation occurrence between respondents from individual wards were quite significant. For example, on surgical wards, as many as 81% of the employees assessed work as highly stressful, whereas on the emergency wards just over 50% gave such an answer. Differences in the distribution of the classification of stress levels at work between the considered wards are statistically significant.

The effect of age on the assessment of stress levels at work in particular areas and on the overall result was examined. The analysis consisted of determining the Spearman's rank correlation coefficients between age and the numerical measures of stressful situation occurrence, determined on the basis of a standardized questionnaire. The analysis was carried out both at the level of the entire population and when controlling for the ward type, because this factor may affect the occurrence of dependence (as previously noted, stress levels depended on the type of ward in which the respondents worked).

At the level of the entire surveyed population, very weak correlations with age were found only in two areas: haste and physical effort. The stressfulness of haste accompanying work increased with age and the stress associated with physical effort decreased with age. However, both of these correlations had negligible strength (Table 4), which means that their practical meaning is almost none.

An alternative form of analysis was also conducted. We divided the respondents into four age groups, presenting the descriptive statistics values in these groups and assessing the differences between them using the Kruskal-Wallis test. This analysis ignored age differences within the created groups, which may lead to different results than the conducted correlation analysis. As shown in Table 5, the created groups were quite numerous, which allowed for reliable analyses.

Analysis of work stressfulness in relation to age groups led to distinguishing one highly significant result; namely, age differentiates the assessment of stress resulting from physical effort. The stress levels associated with this were much higher among employees aged up to 39 years (median 50 points) compared with other people (median 37.5 points). Other burdens were not correlated with age in any way (Table 6).

A similar correlation analysis was performed for each ward. It turned out that this was the right approach, because we found that there were more statistically significant relationships within individual wards. These were also dependencies of slightly greater strength than the two correlations found at the level of the entire population. The analysis results are presented in Table 7. Younger employees in the surgical wards were characterized by higher stress levels. This pertains to areas such as arduousness, responsibility, competition, and the overall result. On the medical treatment wards, there was a similar (to the surgical ward)

TABLE 2: Work arduousness frequency of occurrence in the wards.

Work features assessment (0–100 pts)	Surgical		Medical treatment		Emergency		<i>p</i>
	N	%	N	%	N	%	
Unpleasant working conditions	150	79.4	82	47.7	159	75.0	≤0.001***
Work complexity	143	75.7	141	82.0	157	74.1	0.1629
Hazards	136	72.0	100	58.1	69	32.5	≤0.001***
Conflicts	87	46.0	108	62.8	101	47.6	0.0021**
Organizational uncertainty	107	56.6	108	62.8	75	35.4	≤0.001***
Work arduousness	118	62.4	63	36.6	61	28.8	≤0.001***
Haste	140	74.1	122	70.9	109	51.4	≤0.001***
Responsibility	69	36.5	76	44.2	50	23.6	≤0.001***
Physical effort	97	51.3	99	57.6	85	40.1	0.0023**
Overall result	153	81.0	126	73.3	109	51.4	≤0.001***

p value of statistical significance calculated using the chi-square test.

TABLE 3: Distribution of the arduousness scale in groups.

Overall result	Ward (<i>p</i> ≤ 0.001***)			Total
	Surgical	Medical treatment	Emergency	
Low	9 (4.8%)	13 (7.6%)	7 (3.3%)	29
Medium	27 (14.3%)	33 (19.2%)	96 (45.3%)	156
High	153 (81.0%)	126 (73.3%)	(51.4%)	388
Total	189	172	212	573

p value of statistical significance calculated using the chi-square test.

TABLE 4: Impact of age on the assessment of the working conditions.

Work features assessment (0–100 pts)	Age (years)
Unpleasant working conditions	-0.08 (<i>p</i> = 0.0501)
Work complexity	-0.03 (<i>p</i> = 0.4040)
Hazards	-0.03 (<i>p</i> = 0.5228)
Conflicts	0.03 (<i>p</i> = 0.4827)
Organizational uncertainty	0.01 (<i>p</i> = 0.8987)
Work arduousness	-0.01 (<i>p</i> = 0.8884)
Haste	0.09 (<i>p</i> = 0.0356*)
Responsibility	-0.03 (<i>p</i> = 0.4945)
Physical effort	-0.11 (<i>p</i> = 0.0063**)
Competition	-0.08 (<i>p</i> = 0.0670)
Overall result	-0.03 (<i>p</i> = 0.4553)

TABLE 5: Age groups.

Age (years)	Number	Percent
<30	141	24.7
30–39	158	27.7
40–49	183	32.0
>50	89	15.6

age-to-stress ratio for the areas of organizational uncertainty and physical effort. With age, employees of emergency wards became more indifferent to stress related to unpleasant working conditions, hazards, and physical effort, while stress related to organizational uncertainty increased.

Work experience was very strongly correlated with age (Spearman's rank correlation coefficient between these two features was $R = 0.94$), so it could be expected that the duration of work experience would affect the work stress assessment in a similar way as age. The results in Table 8 confirm this assumption. Only two statistically significant, but very weak, correlations can be found at the level of the entire population—between work experience and the stressfulness of haste (those with more work experience were more susceptible to this factor) and the level of stress induced by physical effort (here, for a change, more work experience was a positive factor in the “immunity” of an employee to physical effort). Both of these correlations had very little strength.

Taking into account the specifics of individual wards in the analysis leads to much more interesting results. Work experience was a factor that had the most significant impact on the stress levels of surgical ward employees. All the distinguished, statistically significant correlations had a negative sign, which means that people with more work experience were more resistant to the occurrence of stressful situations at work. Work experience affected the stress caused by work burdens, responsibility, and the overall result the strongest. Among employees of surgical wards, more work experience had a positive effect (stress levels decreased) on only two areas: organizational uncertainty and physical effort, whereas, among emergency ward employees, longer work experience increased stress levels caused by conflicts, organizational uncertainty, work arduousness, and haste and decreased the stress associated with unpleasant working conditions and physical effort (Table 9).

The relationship between the held position and the assessment of work arduousness was analyzed. Table 10 presents the values of basic descriptive statistics and the significance assessment of differences in the stress levels of employees depending on the performed function. Starting the interpretation from the general stress level, we noted that it was higher among nurses who performed managerial functions and among unit nurses. Nurses in management were particularly vulnerable to stress associated with haste, work complexity, organizational uncertainty, or work

TABLE 6: Assessment of working conditions within age groups.

Work features assessment (0–100 pts)	Age (years)												<i>P</i>
	<30			30–39			40–49			>50			
	\bar{x}	Me	<i>s</i>										
Unpleasant working conditions	28.5	25.0	17.4	26.9	25.0	18.2	25.7	25.0	16.5	25.1	20.0	18.6	0.2925
Work complexity	60.4	58.3	16.2	61.1	62.5	15.2	58.0	58.3	16.4	60.4	62.5	16.5	0.2249
Hazards	61.1	60.0	18.9	61.4	60.0	17.2	59.9	60.0	17.1	59.5	55.0	18.8	0.8362
Conflicts	24.3	25.0	16.9	22.9	18.8	17.0	25.2	25.0	17.4	23.9	25.0	16.5	0.6759
Organizational uncertainty	41.4	37.5	28.0	41.7	31.3	26.2	41.9	37.5	24.3	40.0	31.3	25.6	0.9346
Work arduousness	44.7	41.7	21.0	44.4	41.7	18.4	44.9	41.7	19.1	45.1	41.7	18.5	0.9935
Haste	49.2	50.0	23.6	53.7	50.0	24.0	54.8	50.0	25.1	53.5	62.5	21.4	0.1183
Responsibility	28.3	25.0	26.7	36.2	37.5	31.0	29.6	25.0	28.4	26.7	12.5	28.8	0.1244
Physical effort	44.9	50.0	15.2	44.5	50.0	19.0	39.5	37.5	18.0	41.6	37.5	17.7	0.0096**
Competition	19.3	0.0	28.6	18.4	0.0	29.1	16.5	0.0	28.3	14.6	0.0	28.2	0.2429
Overall result	43.3	41.9	12.9	43.7	41.9	12.0	42.5	39.0	12.4	42.2	39.7	13.4	0.7239

p value of statistical significance calculated using the Kruskal–Wallis test.

TABLE 7: Impact of age on the assessment of the working conditions by ward.

Work features assessment (0–100 pts)	Ward		
	Surgical	Medical treatment	Emergency
	Age (years)		
Unpleasant working conditions	0.00 (<i>p</i> = 0.9853)	-0.01 (<i>p</i> = 0.8684)	-0.23 (<i>p</i> = 0.0009***)
Work complexity	-0.09 (<i>p</i> = 0.2029)	-0.03 (<i>p</i> = 0.6933)	-0.11 (<i>p</i> = 0.1190)
Hazards	-0.08 (<i>p</i> = 0.2608)	-0.05 (<i>p</i> = 0.4879)	-0.16 (<i>p</i> = 0.0222*)
Conflicts	-0.12 (<i>p</i> = 0.1099)	-0.01 (<i>p</i> = 0.8970)	0.10 (<i>p</i> = 0.1600)
Organizational uncertainty	-0.04 (<i>p</i> = 0.5686)	-0.21 (<i>p</i> = 0.0063**)	0.14 (<i>p</i> = 0.0495*)
Work arduousness	-0.17 (<i>p</i> = 0.0165*)	-0.01 (<i>p</i> = 0.8649)	0.09 (<i>p</i> = 0.1981)
Haste	0.06 (<i>p</i> = 0.4196)	-0.01 (<i>p</i> = 0.9262)	0.11 (<i>p</i> = 0.1089)
Responsibility	-0.15 (<i>p</i> = 0.0365*)	-0.08 (<i>p</i> = 0.3181)	0.06 (<i>p</i> = 0.3982)
Physical effort	-0.10 (<i>p</i> = 0.1880)	-0.17 (<i>p</i> = 0.0242*)	-0.15 (<i>p</i> = 0.0285*)
Competition	-0.13 (<i>p</i> = 0.0660)	-0.13 (<i>p</i> = 0.1002)	-0.03 (<i>p</i> = 0.6918)
Overall result	-0.13 (<i>p</i> = 0.0729)	-0.11 (<i>p</i> = 0.1528)	-0.03 (<i>p</i> = 0.7138)

TABLE 8: Impact of work experience on the assessment of the working conditions.

Work features assessment (0–100 pts)	Work experience (years)
Unpleasant working conditions	-0.04 (<i>p</i> = 0.3033)
Work complexity	-0.04 (<i>p</i> = 0.3854)
Hazards	0.00 (<i>p</i> = 0.9654)
Conflicts	0.02 (<i>p</i> = 0.6646)
Organizational uncertainty	0.03 (<i>p</i> = 0.5093)
Work arduousness	0.01 (<i>p</i> = 0.8019)
Haste	0.10 (<i>p</i> = 0.0157*)
Responsibility	-0.04 (<i>p</i> = 0.2995)
Physical effort	-0.13 (<i>p</i> = 0.0028**)
Competition	-0.07 (<i>p</i> = 0.0825)
Overall result	-0.01 (<i>p</i> = 0.7379)

arduousness. Very weak correlations were found in the case of unpleasant working conditions, conflicts, and competition. The only area in which we found no effect of the held position on stress levels was the occurrence of hazards.

Due to the fact that ward type was a factor strongly differentiating assessment of working conditions, analysis of the impact of education on working conditions was done separately for each ward type. To assess the significance of

the differences between the groups the Kruskal–Wallis test was used.

In the group of nurses working in surgical wards, education had a statistically significant impact on the perception of working conditions in several dimensions. The people with the lowest education evaluated working conditions the best. The difference between people with a higher and those with a secondary education with a specialization was definitely smaller, and often assessments of working conditions in these two groups were almost identical (Table 11).

Among people working on medical treatment wards, the impact of education on the assessment of working conditions was not as pronounced. Only the assessment of stressogenicity related to responsibility and physical effort differed in a statistically significant way due to the education level. In this first dimension (responsibility), people with higher education had the highest stress levels. In the second dimension (physical effort), the differences were not so clear and logically oriented, so it is difficult to interpret these results unambiguously.

From the nurses working on the emergency ward, education differentiated the assessment of unpleasant working conditions, work complexity, and uncertainty resulting from

TABLE 9: Impact of work experience on the assessment of the working conditions by wards.

Work features assessment (0–100 pts)	Ward		
	Surgical	Medical treatment	Emergency
	Work experience (years)		
Unpleasant working conditions	-0.04 ($p = 0.6275$)	0.00 ($p = 0.9823$)	-0.16 ($p = 0.0199^*$)
Work complexity	-0.15 ($p = 0.0363^*$)	-0.03 ($p = 0.7224$)	-0.07 ($p = 0.3274$)
Hazards	-0.10 ($p = 0.1925$)	-0.05 ($p = 0.5337$)	-0.11 ($p = 0.1119$)
Conflicts	-0.15 ($p = 0.0413^*$)	-0.02 ($p = 0.8190$)	0.13 ($p = 0.0545$)
Organizational uncertainty	-0.06 ($p = 0.4512$)	-0.18 ($p = 0.0244^*$)	0.17 ($p = 0.0108^*$)
Work arduousness	-0.26 ($p = 0.0003^{***}$)	0.04 ($p = 0.6043$)	0.14 ($p = 0.0453^*$)
Haste	-0.01 ($p = 0.8879$)	0.04 ($p = 0.6074$)	0.16 ($p = 0.0176^*$)
Responsibility	-0.19 ($p = 0.0111^*$)	-0.06 ($p = 0.4128$)	0.07 ($p = 0.3459$)
Physical effort	-0.12 ($p = 0.0975$)	-0.18 ($p = 0.0213^*$)	-0.15 ($p = 0.0274^*$)
Competition	-0.16 ($p = 0.0275^*$)	-0.12 ($p = 0.1409$)	0.02 ($p = 0.7978$)
Overall result	-0.20 ($p = 0.0076^{**}$)	-0.09 ($p = 0.2739$)	0.04 ($p = 0.5309$)

TABLE 10: Impact of performed function on the assessment of the working conditions.

Work features assessment (0–100 pts)	Function												p	
	Managerial			Ward nurse			Surgical nurse			Other				
	\bar{x}	Me	s	\bar{x}	Me	s	\bar{x}	Me	s	\bar{x}	Me	s		
Unpleasant working conditions	19.1	15.0	20.1	27.0	25.0	18.0	26.4	25.0	14.8	27.0	30.0	12.3	0.0221*	
Work complexity	64.1	64.6	16.0	61.2	62.5	15.4	47.7	43.8	16.3	59.1	62.5	16.0	$\leq 0.001^{***}$	
Hazards	57.7	55.0	22.3	61.2	60.0	17.7	59.8	65.0	17.9	55.8	55.0	13.9	0.3293	
Conflicts	29.7	31.3	14.8	24.6	25.0	17.1	20.5	12.5	18.2	20.7	25.0	13.2	0.0114*	
Organizational uncertainty	48.9	43.8	24.7	42.7	37.5	26.1	36.9	31.3	23.7	27.6	18.8	22.4	$\leq 0.001^{***}$	
Work arduousness	46.1	41.7	14.8	46.1	41.7	19.9	34.3	33.3	16.8	42.5	41.7	11.4	$\leq 0.001^{***}$	
Haste	59.8	62.5	24.6	54.6	50.0	23.2	43.5	50.0	25.9	41.4	37.5	22.0	$\leq 0.001^{***}$	
Responsibility	39.3	25.0	34.8	32.4	37.5	28.7	24.8	12.5	27.3	12.2	0.0	20.2	$\leq 0.001^{***}$	
Physical effort	40.6	37.5	15.1	44.3	50.0	17.0	32.1	25.0	22.5	38.5	37.5	12.8	$\leq 0.001^{***}$	
Competition	16.1	0.0	22.8	18.5	0.0	28.9	13.4	0.0	27.8	11.2	0.0	27.7	0.0456*	
Overall result	44.6	41.9	11.5	44.0	41.9	12.5	37.2	33.1	12.4	37.8	37.5	11.1	$\leq 0.001^{***}$	

p —value of statistical significance calculated using the Kruskal–Wallis test.

TABLE 11: Impact of education on the assessment of the working conditions of nurses on surgical wards.

Work features assessment (0–100 pts)	Education												p	
	Secondary (N=33)			Secondary with specialization (N=41)			Higher (N=115)							
	\bar{x}	Me	s	\bar{x}	Me	s	\bar{x}	Me	s	\bar{x}	Me	s		
Unpleasant working conditions	30.0	30.0	17.1	30.5	30.0	16.0	32.7	35.0	17.5	35.0	35.0	17.5	0.1652	
Work complexity	49.9	50.0	14.1	62.8	66.7	14.9	62.4	62.5	16.1	62.5	62.5	16.1	$\leq 0.001^{***}$	
Hazards	62.4	65.0	15.3	68.8	65.0	19.1	68.2	70.0	17.4	70.0	70.0	17.4	0.1536	
Conflicts	16.5	12.5	13.2	24.2	18.8	15.7	23.6	18.8	17.0	23.6	23.6	17.0	0.0623	
Organizational uncertainty	34.7	37.5	19.6	46.6	43.8	24.8	47.5	37.5	27.8	47.5	47.5	27.8	0.0793	
Work arduousness	39.1	33.3	15.2	50.6	58.3	21.3	55.9	58.3	16.6	58.3	58.3	16.6	$\leq 0.001^{***}$	
Haste	35.2	25.0	24.9	58.2	62.5	22.1	63.2	75.0	23.4	75.0	75.0	23.4	$\leq 0.001^{***}$	
Responsibility	15.5	0.0	28.1	35.4	37.5	34.4	35.3	25.0	35.3	35.3	35.3	33.1	0.0035**	
Physical effort	32.2	25.0	18.0	47.0	50.0	20.1	44.0	50.0	18.3	44.0	50.0	18.3	$\leq 0.001^{***}$	
Competition	9.8	0	25.0	17.1	0	28.2	17.4	0	28.2	17.4	0	29.3	0.1395	
Overall result	37.0	33.1	11.2	47.3	49.3	13.8	48.0	47.1	11.2	48.0	47.1	11.2	$\leq 0.001^{***}$	

p —value of statistical significance calculated using the Kruskal–Wallis test.

the organization of work. In the first two areas, the higher a nurse's education, the worse the assessment of that particular dimension. In terms of organizational uncertainty, the worst assessments were obtained from nurses with a secondary education with a specialization.

Finally, a multivariate analysis was done. A regression model was constructed for the overall assessment of work conditions, in which, apart from nominal factors, which were ward and education, the potential impact of age and work experience was also considered. These variables had

numerical values, so they were treated as continuous variables. The models also considered the 2nd-degree interactions between all factors. Using the stepwise regression procedure, the optimal model was selected. This model included only nominal factors: ward ($p = 0.0000^{***}$) and education ($p = 0.0001^{***}$); the interaction between them was also significant ($p = 0.0185^*$). The nurses' work experience and age did not differentiate in a statistically significant way the total assessment of working conditions.

Since only two nominal factors remained in the model, the results can be described in terms of analysis of variance, presenting the values of descriptive statistics in the compared groups. Table 12 presents average values and standard deviation. To facilitate the interpretation of the results, a graphic presentation (Figure 4) of group averages with a 95% confidence interval and a typical range of variation was also included. Analyzing the distribution of group averages, we can state that

- (i) People with a higher education assessed working conditions more negatively
- (ii) Nurses working in the emergency ward assessed their conditions the best and assessed their stress levels the lowest
- (iii) The effect of education on the working conditions assessment depended on the ward, with the largest differences in assessments occurring on the surgical ward

4. Discussion

Numerous studies conducted in different countries have shown that working as a nurse is characterized by clearly higher stress levels than the average stress levels for the employed population [16]. Poland has one of the lowest nursing employment rates (5.2 per 1000 residents) in Europe and a high rate of leaving the profession. The average age of Polish nurses has been constantly growing for several years—in 2016 it was 50.79, while in 2008 it was 44.19. These data confirm that young nurses are the first to leave the profession. It is similar in other European countries, such as Italy [17], Finland [18], and Sweden [19]. Many studies from different countries have shown that in addition to such factors as low wages or labor migration, working conditions have a huge impact on the number of nurses leaving the profession [20–25].

In this article, we decided to examine which factors affect the assessment of work arduousness among the nursing staff and whether there are determinable correlations between them. There have been many studies on stress [26] and recommendations on what measures should be taken to minimize the negative effects of stress. The majority of studies treated nurses as a homogeneous group, regardless of age, work experience, place of work, and sex, or these studies were conducted within a specific ward, such as intensive care or emergency. For our study, we selected three types of hospital departments—surgical, medical treatment, and emergency wards—to compare whether the results within individual wards differ from those obtained for the entire

studied population. This was to verify whether individual work conditions, characteristics of individual wards, affect the assessment of work stressfulness.

Study results showed that at the level of the whole surveyed group, the nurses' age, education, and work experience did not differ statistically significantly in the total assessment of working conditions. Differences in the assessment of work arduousness levels in different age categories occurred at the level of individual wards. Similar results were also obtained in the case of work experience, education, and the position held. All these factors correlated differently depending on the ward, and even in many cases, any correlation occurred within the ward and did not occur in the entire studied population.

Similarly, research conducted in Iran showed a lack of correlations at the level of the whole group between demographic factors (such as age, sex, education, work experience) and the level of work satisfaction, which was strongly related to stress levels [27]. Studies conducted in Sudan in public hospitals in Khartoum State [28] and in private and public hospitals in Amman, Jordan [29] showed that the psychosocial burden felt by nurses varied depending on the ward, similarly to our results. Research on work satisfaction among nurses in Great Britain also indicated the need to conduct analyses at the level of individual hospital departments [25]. Our research showed not only differences in the psychosocial burden depending on the ward, but also other correlations between age, work experience, and education and psychosocial factors occurring within various ward types.

Keeping in mind the earlier observation that the youngest nurses most often leave the profession, we examined how age and experience affected the nurses' perception of psychosocial burdens. The obtained results indicate that with age, employees become more immune to certain stressors. On the surgical wards, the most noticeable were arduousness, responsibility, and competition for young employees; on medical treatment wards, uncertainty resulting from the organization of work and physical effort; while on the emergency ward, unpleasant working conditions, hazards, and physical effort. A similar effect was observed in the case of work experience. Employees with the least work experience felt burdens almost identically to the youngest employees, except for the emergency ward, where no correlations were found in the case of hazards, while inverse correlations were found in the case of uncertainty resulting from the organization of work and haste. These two factors in the case of employees of emergency wards increased with experience.

This can be explained by the fact that with age, and thus with increased experience, some factors become less and less stressful, probably due to the fact that employees somehow get used to certain working conditions and do not perceive them as negatively as initially. Research conducted at the Medical University of Gdańsk among nurses employed in hospitals [30], outpatient clinics, and social care homes showed, similarly to our results, the highest levels of psychosocial burden among the youngest nurses. Studies carried out in Italian hospitals [31] showed that good workplace

TABLE 12: Overall assessment of work conditions.

Education	Overall assessment of work conditions					
	Surgical		Ward		Emergency	
	\bar{x}	s	\bar{x}	s	\bar{x}	s
Secondary	37.0	11.2	44.6	15.4	35.4	6.3
Secondary with specialization	47.3	13.8	42.6	14.3	37.7	8.5
Higher	48.0	11.2	47.3	12.7	38.8	10.9

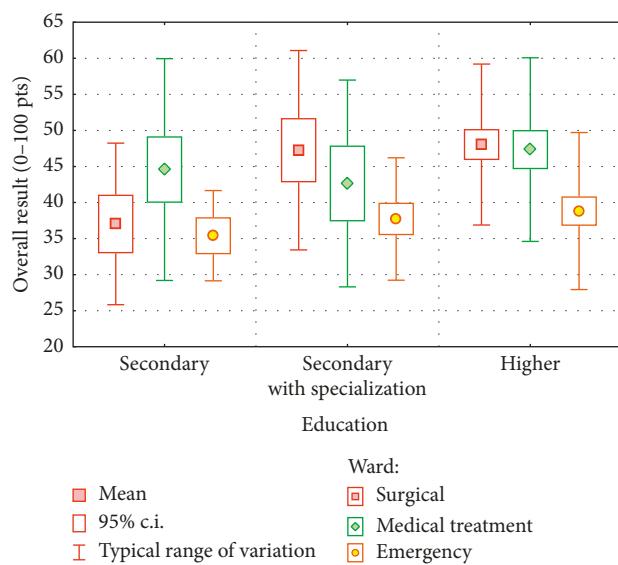


FIGURE 4: Overall assessment of work conditions.

conditions positively stimulated a decline in work efficiency progressing with age, whereas a study conducted in four hospitals in Poland showed that nurses over 40 had the highest emotional exhaustion rate [32]. This is quite different from our study results.

An important result of the conducted research is also an indication of the burdens that did not depend on the nurses' age or experience. Regardless of the ward where the nurses worked, work complexity, conflicts, and haste were felt regardless of age, and hazards regardless of experience.

Organizational uncertainty, or a feeling of a threat of job loss, is a more stressful factor than the loss of work alone [33]. This factor intensified with age and work experience. This was confirmed by our research in the case of the emergency ward, and a completely different result was obtained for the medical treatment ward, where this factor decreased with age.

The psychosocial burden that nurses experience in their daily work may be the cause of their mistakes (incorrect doses, inappropriate medicines). This fact was confirmed by research conducted in public hospitals in Tehran, which showed a close correlation between the stress experienced by nurses and the number of mistakes made during treatment [34]. Similar results were obtained in India [35], as well as in Canada [36], showing a correlation between stress levels and the number of mistakes, injuries, and negligence.

The psychosocial burden had an impact on general job satisfaction among nurses, which in turn leads to employees being more likely to start looking for other career opportunities [37]. This is particularly important in the context of our obtained results, according to which the assessment of work arduousness of nurses working in managerial positions and those better educated was worse than other nurses. Nurses employed in managerial positions in the entire studied population assessed their workplace worse in all the assessed areas, with the exception of hazards. Education differentiated the assessment depending on the ward. We identified the presence of the most features on surgical wards: work complexity, arduousness, haste, responsibility, and physical effort whereas on medical treatment wards only responsibility and physical effort and on emergency wards unpleasant working conditions and work complexity. On the basis of such results, we can draw two conclusions. First, nurses with higher education and employed in managerial positions assess their working conditions worse, because they are usually burdened with more responsibility and a broader scope of duties. Second, thanks to their education, and usually more work experience, they are more aware of the hazards in the workplace.

One of the limitations of the conducted research is that we show a static picture of the psychosocial burdens in the nurses' workplace. An interesting issue seems to be the impact of global economic changes on the dynamics of psychosocial burdens in the workplace. The negative impact of the global crisis on workers' health was confirmed in the results of research carried out in Northern Ireland [38].

Summing up the results of our research, we found that the factors that influence the assessment of the nurses' working conditions were the position and type of ward they were employed in. Age, work experience, and education did not have a statistically significant impact on the assessment of nurses' working conditions if we treated the nurses as a homogeneous group. The results changed radically if we conducted analyses within the ward type. We then found statistically significant dependencies of the assessment of working conditions depending on age, work experience, education, and position held. In all the wards, the youngest employees were the most exposed to stress, but the most stressful was other work features in each ward. In the surgical ward, these were arduousness, responsibility, and competition; in the medical treatment ward: organizational uncertainty and physical effort; and in the emergency ward: unpleasant working conditions, hazards, and physical effort. Little work experience intensifies stress in the surgical wards,

especially in terms of arduousness and responsibility; in the medical treatment ward: organizational uncertainty and physical effort; and unpleasant working conditions and physical effort in the emergency ward. Only in the emergency ward, as many as four features—organizational uncertainty, haste, arduousness, and conflicts—were perceived worse by employees with more work experience. Higher education affected a more critical assessment of the working conditions, which, however, differed between the wards. In the surgical ward, people with higher education experienced work complexity, arduousness, and haste as the worst; in the medical treatment ward, it was responsibility and physical effort; and in the emergency ward, unpleasant working conditions and work complexity.

In the face of staff shortages among nurses, which are intensifying due to the aging of society, it is necessary to diagnose factors that increase the stressfulness of work, so that effective actions to counteract them can be taken. Particular attention should be paid to young people, with less work experience and better education, as they are the most susceptible to the psychosocial burden and leave the profession the most often.

5. Conclusions

- (1) The study results indicate the need to diagnose problems related to work conditions in the context of occupational stress within individual hospital wards. To limit employee turnover, nursing staff managers should approach the issue of improving working conditions individually for each ward, due to differences in the nature of the work and level of stressogenicity.
- (2) In each hospital ward, employees at different stages of their career are sensitive to the psychosocial burden resulting from different work characteristics. These areas should be thoroughly diagnosed and the burden minimized to prevent departures from the profession—at early stages of the professional career as well as among experienced personnel.
- (3) Nurses working in managerial positions should receive the necessary substantive support, due to the higher stress burden associated with greater responsibility.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Research Article

Self-Evaluation of Anxiety in Dental Students

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Aim. The aim of the study was to analyze anxiety in female and male dental students related to their first procedure performed on a pediatric patient as part of their study curriculum. **Materials and Methods.** The study was carried out in eighty-four 3rd year dental students (75.00% females and 25.00% males), aged 22–28 years. The participation in the research was anonymous and voluntary. The study was performed during clinical classes in pediatric dentistry where the students were supposed to perform simple prophylactic or therapeutic procedures on pediatric patients. To assess anxiety, a State-Trait Anxiety Inventory was used prepared by Spielberger et al. based on the American STAI questionnaire of 1970 that is composed of two-parts scales: the X-1 scale to assess anxiety as a state and the X-2 scale to assess anxiety as a trait. For statistical analysis, the Wilcoxon signed-rank test, Pearson's chi-squared test, and Mann-Whitney test as well as Statistica 10 programme were used. **Results.** The results obtained from the first and second part of the questionnaire concerning anxiety as a state and as a trait showed high level of anxiety as a state in 51.19% of the students and as a trait in 32.14% and low level in 19.05% and 41.67%, respectively. The obtained results showed minimal and maximal values to be 24 and 71, respectively, for the STAI-1 scale (mean = 40.55), and 24 and 57, respectively, for the STAI-2 scale (mean = 41.75). **Conclusions.** The results show that the anxiety level during clinical classes is relatively high in the studied population of students. Preparing the students to cope with stress resulting from treating the patients seems to be of importance. Such programmes should be implemented before the start of practical clinical classes. The acquired knowledge will be useful in further professional career.

1. Introduction

The notion of “dental anxiety” is usually related to anxiety felt by dental patients [1]. However, it needs to be remembered that people providing health care, such as dental staff, are also overwhelmed with such emotions, especially at an onset of their professional career. The emotions are invariably at their peak when future dentists are preparing for their professions, i.e., during their studies.

Dentists might experience occupational stress from their interaction with staff and patients, problems in the treatment

of patients, fears of litigation from their patients, time pressure, and paper work as well as concerns about the financial viability of their practice or defective equipment [2–4]. It is worth mentioning that financial crisis might also affect the medical professionals’ well-being [5]. Economic instability can result in mental and physical consequences like anxiety, depression, or psychological well-being [6]. Moreover, uncertainty of students concerning future work may cause such problems.

Medical education aims are, firstly, to master theory and, secondly, to work with patients practically and perform

simple therapeutic procedures. Although this is done under professional supervision of teachers, still certain procedures should be carried out by the undergraduate students themselves [7, 8]. Practical classes in pediatric dentistry clinics pose special difficulties as young patients are special. Moreover, the students need to communicate with their parents or guardians. Students of dentistry are exposed to such difficulties because young patients are often anxious for dental treatment.

Literature data show that students' anxiety is increased by their patients' tension caused by the performed procedure [9]. A negative impact of stress on mental and physical health of the students has also been emphasized [9, 10]. It has been proven that stress affects professional efficacy of the trained person by limiting their concentration, attention, and decision-making skills as well as the patient-doctor rapport [10]. Needless to say, mental stress might cause an abnormal activation of the sympathetic nervous system initiating hormonal cascades [5]. Moreover, the psychological condition might worsen the inflammatory response or increase the levels of blood cortisol. Additionally, an increase in some other chronic diseases prevalence, such as asthma, was explained by work-related stress [5].

Dental profession is considered as one of the most stressing medical specialties [11]. Stress-related and musculo-skeletal diseases are the most common reasons why dentists retire from their profession prematurely [11, 12]. It must be emphasized that prolonged psychological and physical exhaustion might lead to work burnout in the susceptible practitioner [2, 13].

There are many anxiety assessment tests applied in psychological practice, one of them being the STAI questionnaire, i.e., State-Trait Anxiety Inventory introduced by Spielberger et al. [14]. The test is widely applied and may be used on various population groups [15]. Moreover, the STAI is used in the screening of the individual diagnosis and research [15].

The aim of the study was to analyze anxiety in female and male dental students related to their first examination performed on a pediatric patient as a part of their study curriculum.

We suggested the following hypotheses: (1) anxiety level of 3rd year dental students while carrying out procedures in pediatric patients will be high; (2) there will be no difference between anxiety level in females and males.

2. Materials and Methods

All eighty-four 3rd year Polish dental students of the Poznan University of Medical Sciences, that studied in the academic year 2011/2012, entered the survey between March and April 2012. The group included 63 females (75.00%) and 21 males (25.00%), aged 22–28 years.

The study was carried out during clinical classes in pediatric dentistry where the students were supposed to perform simple prophylactic or therapeutic procedures on pediatric patients. The subject's participation in the research was anonymous and voluntary. The students were informed that they might refuse to participate or withdraw from the

study, at any time. Initially, the survey was fully explained to the students and the instruction was read by a supervising psychologist and pedodontist. Following that, the students filled in the questionnaire individually. Data were collected through paper-and-pen questionnaires in a seminar rooms. All the participants gave full answers in 30 minutes. Finally, all participants completed the questionnaire (response rate = 100%).

To assess anxiety, a Polish version of the State-Trait Anxiety Inventory was used which was prepared and adapted by Spielberger et al. [16] based on the American STAI questionnaire of 1970 [14]. This method enables detection of people with definitely low or definitely high level of anxiety as a constant inner predisposition (trait) and is useful to register changes in anxiety intensity in response to specific external stimuli. The STAI questionnaire is composed of two-parts scales: the X-1 scale to assess anxiety as a state, and the X-2 scale to assess anxiety as a trait. Each of them consists of 20 items to which the examined person responds by checking out one of the 4 categorized answers. To describe their subjective feelings towards a statement, the study participant classifies them in the STAI-1 four-point scale as "not at all" (the value of 1), "somewhat" (2), "moderately so" (3), and "very much so" (4), while in the STAI-2 scale as: "almost never" (the value of 1), "sometimes" (2), "often" (3), and "almost always" (4) [15].

The values obtained in each of the scales range from 20 to 80 points, with the 20–40 range described as a low level of anxiety, 41–60 as moderate anxiety, and 61–80 as a high anxiety.

The results were analyzed in three categories of anxiety as a state: low, normal, and high state of anxiety. For the analysis of anxiety as a trait, similar categories were applied.

Continuous variables were presented as means, SD, min value, and max value while nominal variables were presented as a percentage of subjects in particular categories of STAI (low, normal, and high).

Distribution of continuous variables (STAI-1 and STAI-2) was tested by means of Shapiro-Wilk test. Since the data were not normally distributed, the differences between them were assessed with nonparametric Wilcoxon matched-pair test.

The difference test between two proportions was used to check the differences between the percentage of women and men for each level of anxiety, both for anxiety as a state and anxiety as a trait. This test was also used to compare the percentage of people with different levels of anxiety, separately for women and separately for men.

The statistical analysis has been carried out with DELL STATISTICA (data analysis software system) version 13 Dell Inc (2016, software.dell.com). A value of $p \leq 0.05$ was considered statistically significant.

3. Results

The results obtained from the first and second part of the questionnaire concerning anxiety as a state and as a trait showed high level of anxiety as a state in 51.19% of the

students and as a trait in 32.14% and low level in 19.05% and 41.67%, respectively (Table 1).

Result analysis showed high level of anxiety as a state in 47.62% females and 61.90% males, while anxiety as a trait was high in 31.75% and 33.33%, respectively. Low anxiety as a state level was noted in 20.63% females and in 14.29% males, and for anxiety as a trait, these values were 41.27% and 42.86%, respectively (Table 1). Statistical significance was observed between groups of females with low and high anxiety as a state ($p = 0.02$) and between males with low and high ($p = 0.004$) as well as normal and high ($p = 0.01$) anxiety as a state.

The obtained results showed minimal and maximal values to be 24 and 71, respectively, for the STAI-1 scale, and 24 and 57, respectively, for the STAI-2 scale. Average values were 40.55 (STAI-1) and 41.75 (STAI-2) (Table 2). Statistical analysis has not revealed significance between anxiety as a state and as a trait.

The answers obtained from the I and II part of the questionnaire evaluating anxiety as a state and as a trait show that in the studied group of 35 students who presented with low anxiety as a trait, 14 of them (40.00%) presented with a low level of anxiety as a state, while within 27 students whose anxiety as a trait was classified as high, 21 (77.78%) presented also with high level of anxiety as a state. Statistical analysis displayed statistical relationship between the studied state and trait ($p = 0.0001$) (Table 3).

4. Discussion

Obligatory curriculum of the study of dentistry includes theoretical as well as practical training. In Poland, the guidelines developed by the Ministry of Science and Higher Education provide for 85% of classes to be carried out as clinical training involving the treatment of patients.

Dental students are exposed to stressing situations during clinical classes as part of their curriculum [17]. However, publications concerning this issue are scarce. Moreover, there is no information on the number of Polish students seeking help from a psychiatrist or a psychologist to cope with such problems.

Practical classes in pediatric dentistry are preceded by theoretical lectures and seminars, phantom classes, and patient-doctor communication instruction classes. The students also do summer training which is supposed to prepare them for the work with patients. Practical classes as a part of the third year curriculum are one of the first clinical classes in the dental studies and involve noninvasive procedures, mostly prophylactic, to be performed by the students. Examination of a young patient is always done under the supervision of experienced doctors; therefore, the students are able to consult their supervisor on every stage of clinical management. The presence of a parent or legal guardian is also accepted. The students not only treat but also educate young patients and their parents on proper diet, oral hygiene, prevention of caries, and oral mucosa inflammation.

In the students' opinion, a direct relationship with a patient causes additional difficulties comparing to phantom

TABLE 1: Anxiety as a state (STAI-1) and anxiety as a trait (STAI-2).

		Females	Males	Total	* p value Females vs males
STAI-1					
Low	N	13	3	16	
	%	20.63	14.29	19.05	ns
Normal	N	20	5	25	
	%	31.75	23.81	26.76	ns
High	N	30	13	43	
	%	47.62	61.90	51.19	ns
Total		63	21	84	
		Low vs normal	ns	ns	
<i>* p value</i>		Normal vs high	ns	<i>p</i> = 0.01	
		Low vs high	<i>p</i> = 0.02	<i>p</i> = 0.004	
STAI-2					
Low	N	26	9	35	
	%	41.27	42.86	41.67	ns
Normal	N	17	5	22	
	%	26.98	23.81	26.19	ns
High	N	20	7	27	
	%	31.75	33.33	32.14	ns
Total		63	21	84	
		Low vs normal	ns	ns	
<i>* p value</i>		Normal vs high	ns	ns	
		Low vs high	ns	ns	

*Difference test between two proportions.

TABLE 2: Average, minimal, and maximal STAI values.

Scale	N	X ± SD	Min–Max
STAI-2	84	41.75 ± 7.63	24.00–57.00
STAI-1	84	40.55 ± 10.54	24.00–71.00
<i>* p value</i>			ns

*Wilcoxon matched-pair test.

classes simulations, as not only theoretical knowledge needs to be verified practically but also own emotions have to be tamed. Such reactions are likely to appear during clinical classes in pediatric dentistry when undertaking prophylactic and therapeutic actions on patients in the developmental age.

It is commonly known that a new experience, like performing a procedure for the first time, may cause significant anxiety and stress both in adepts of medical art and experienced doctors with many years of practice [9].

Supposingly, anxiety level varies and depends, among others, on personality and temperament of an operator [13]. Therefore, assessment of anxiety as a trait in dental students shows them being or not being ready for delivering dental care during clinical classes to a patient in the developmental age.

Kaczmarek et al. [18] researched anxiety in 53 fourth year dental students before they were to start dental

TABLE 3: Relationship between anxiety as a state (STAI-1) and as a trait (STAI-2).

Anxiety level	STAI-1	STAI-2			Total	p value		
		1	2	3		1 vs 2	2 vs 3	1 vs 3
Low	1	N	14	2	0	16	<i>p</i> = 0.04	<i>p</i> = 0.005
		%	40.00	9.09	0.00			
Normal	2	N	11	8	6	25	ns	ns
		%	31.43	36.36	22.22			
High	3	N	10	12	21	43	<i>p</i> = 0.01	<i>p</i> = 0.02
		%	28.57	54.55	77.78			
Total		N	35	22	27	84		<i>p</i> = 0.0001
		%	41.67	26.19	32.14			
* <i>p</i> value	Low vs normal	ns	<i>p</i> = 0.03	<i>p</i> = 0.01				
	Normal vs high	ns		<i>p</i> = 0.0001				
	Low vs high	ns	<i>p</i> = 0.001	<i>p</i> = 0.0001				

*Difference test between two proportions.

treatment of children. The study showed that half of the students present with moderate anxiety, both as a trait (54.3%) and state (55.0%). The authors were mainly focused on the students' stress management, based on the COPE scale-questionnaire. The most common strategy to deal with stress was "positive perception of the world and development," and the least common is "the use of stimulants." Some students chose "negation/ignoring the problem" as a way to cope with stress [18].

Babar et al. [19] studied 529 students of dentistry studying on the years from first to fifth in one of the private colleges in Malaysia. The Dental Environment Stress (DES) questionnaire was applied to evaluate stress level. Interestingly, the fear of failure in a course was the greatest stressor, as described by the students of all years.

Davidovich et al. [20] researched self-reported stress of general practitioners, dental students, and specialists in pediatric dentistry during the performance of different procedures in pediatric patients. The authors revealed that for the experienced dentists, both the general practitioners and the specialists, injection of local anesthesia to an anxious child was the most stressful procedure. However, dental students reported placing a rubber dam as such a challenge.

Studies by various authors point to different types of stimulants used by the students experiencing mental or emotional tension and stress [4, 22, 23, 21]. Sniatala et al. [21] performed a survey among 187 Polish students of a medical college including the students of dentistry (78.07%) and oral hygiene (21.93%). The study has shown that 12.30% of the respondents referred to cigarette smoking and 10.70% to alcohol consumption in stressful situations. Ne'Eman-Haviv and Bonny-Noach [22] performed a questionnaire study in 814 undergraduate students concerning association between the use of alcohol, tobacco, cannabis, and medical and nonmedical prescription stimulants (MNPS) and cognitive test anxiety (CTA). The study has shown that CTA was higher among users of MNPS than among students who did not use such substances. This is in agreement with Erdal et al.'s results [23] of the research on the students of Gaziosmanpasa University in Turkey who smoked cigarettes, since thirty percent of them admitted they smoke to reduce stress. Moreover, it must be emphasized that the risk of

addiction, both somatic and psychical, to various chemical substances is greater if they are applied to reduce stress [24]. Needless to say, addictive use during medical school may affect students' professional and personal lives [25].

On the other hand, the dental environment-induced stress could negatively affect well-being of students [26]. They might be unable to interact with the patients or to continue studying and working. Therefore, due to elevated level of stress their career options can be reduced.

At present, there are different methods available to fight stress. Shankarapillai et al. [27] described an advantageous effect of yoga on reducing state-trait anxiety level in students of dentistry. Moreover, deep breathing, progressive muscle relaxation, or hypnosis are also recommended [10].

Pereira et al. [28] presented data concerning an elective course named "Strategies of Coping with Professional Stress" which was offered to medical students of a midwest public Brazilian university. Interestingly, majority of students (67.1%) answered that their stress symptoms decreased by the end of the course. Moreover, it must be emphasized that the students were eager to participate in the electives what proves their great interest in the issue and their belief that there is a need to be rightly prepared to cope with stress, both during the studies and in future work.

Piazza-Waggoner et al. [9] carried out research on 26 second year students of dentistry to assess their anxiety during their first treatment of a pediatric patient. Their initial assessment was done using a Visual Analog Scale (VAS) and STAI and COPE (Coping Orientation with Problems Experienced) questionnaires. The students were divided into two groups: anxiety management group and attention control group. In the first group, the participants received training on relaxation methods, including deep breathing and progressive muscle relaxation. Additionally, they were given a cassette with an instruction on how to perform these exercises and were supposed to listen to it while doing the exercises at least once a day. The control group attended a lecture on the relationship between anxiety, stress, and health and received a cassette with an ocean waves sound recorded, without any instruction. The authors showed that anxiety as a trait (STAI Trait Score) in the

students ranged between 24 and 59 (average 37.5; SD = 9.8), while anxiety as a state (STAI State Score) between 20 and 54 (average 35.0; SD = 10.1).

Therefore, it seems necessary to carry out exercises to reduce the anxiety level. The students may practice such relaxation themselves or during breaks between classes. These procedures are costless and may bring only positive effect.

Finally, some strength and limitations of the present study should be described. On the one hand, the strength of the study was that all 3rd year Polish dental students, who studied at the Poznan University of Medical Sciences during the research, were examined. However, the sample is not representative of the population of the entire Polish third year dental students since they were from one university. Therefore, it is suggested that such studies should be carried out, using the same methodology, in most dental schools in the country. Moreover, it seems necessary to continue the research to compare the results with those obtained for the same students in the following years. It could be interesting to perform such follow-up to observe the changes in the level of anxiety in individuals. Another limitation is that most of the researchers did not use the same methodology but rather different questionnaires. Therefore, it is difficult to compare the results with those of other authors. However, main strength of the present study is to highlight a state of anxiety in dental students that could have a detrimental effect in performance and learning of dental techniques.

Additional, our data were based on self-reported measures (i.e., questionnaire), which might be influenced by mono-method bias. But future survey may therefore benefit from replicating our findings in longitudinal studies.

However, the implications derived from the present research appear useful since they might show what level of anxiety dental students represent. Therefore, special programs concerning stress fighting and relaxation may be introduced at the universities [29]. It needs to be emphasized that young adults form a population with specific characteristics that have to be taken into account in the management of occupational risks. The implications derived from this study might also be helpful at the individual level for mental health service purposes if any person may need such support.

5. Conclusions

The results show that the anxiety level during clinical classes is relatively high in the studied population of students. Preparing the students to cope with stress resulting from treating the patients seems to be of importance. Such programmes should be implemented before the start of practical clinical classes. The acquired knowledge will be useful in further professional career.

Data Availability

All data are available on request.

Ethical Approval

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Consent

Informed consent was obtained from all participants for being included in the study.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Research Article

Psychosocial and Ergonomic Conditions at Work: Influence on the Probability of a Workplace Accident

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Today, the economic and social importance of occupational accidents is undeniable worldwide. Hence, research aimed at reducing this type of accident is considered a discipline of great interest for society in general. In this environment, working conditions play a fundamental role in the occurrence of accidents, and from their study, results can be obtained that provide information for decision-making that guarantee optimum conditions for the development of the employees' tasks. Organizing the conditions of work execution is also a task that constitutes an essential aspect for a firm's productivity, therefore, affecting their viability and results. In this work, a model is proposed for the study of different groups of working conditions and their influence on the probability of occupational accidents, in accordance with the data provided by the 7th National Survey of Working Conditions (VII NSWC). The survey sampled 8892 workers active in all sectors of national production and is the last nation-wide survey administered in Spain. Bayesian networks (BNs) are used to generate a network that analyzes working conditions in all areas (27 variables have been included in addition to those corresponding to the sector and accident), and then, more specifically, the relationship that is established between ergonomic factors in the workplace, psychosocial factors of the worker, and the probability of an accident. The results are achieved through the network obtained by highlighting some of the proposed variables. The dependencies generated by the chosen variables are analyzed, and subsequently, the probability of accident for each of the productive sectors is determined. It is concluded that the ergonomic risks associated with physical strains in the workplace, together with the lack of job satisfaction on the employer's behalf, both pose a very significant increase in the probability of being involved in an occupational accident, above the other variables of study.

1. Introduction

The development of scientific knowledge for study of occupational accident rates, the search for causality, and subsequent data treatment focused on reducing those rates in the workplace, is the priority raised by this article. Occupational accident rates remain at worrying levels with significant socioeconomic consequences in all countries, and its decrease is the goal that all parts involved must pursue.

The competitiveness of companies as well as their success are, in turn, conditioned by this problem because the worker's productivity is affected, and therefore, production costs increase.

The current legislation in Spain requires ensuring health and safety at work as one of the guiding principles of social and economic policy, and being directly derived from is the determination of the basic body of guarantees and responsibilities which are necessary to establish an adequate level of protection for the workers' health against the risks that might arise from working conditions [1].

In Spain, the statistical data report a sharp decrease in occupational accidents over the period between 2008 and 2013; the lowest number of occupational accidents in the daytime having been registered in 2013. As from that year, the numbers of occupational accidents have increased up until 2017.

It is evident that the economic recession, from 2007 to 2013, led to a significant decrease on the number of active workers, and by observing the incidence rate (equation (1),

$$\text{incidence index} \left(i = \frac{\text{num. of accidents in the working day with sick leave} \times 10^5}{\text{average num. of workers exposed}} \right). \quad (1)$$

The present study is based on data provided by the VII National Survey of Working Conditions (VII ENCT) published in 2012 by the National Institute of Occupational Safety and Hygiene [2]. This database gathers workers' responses on their working conditions and studies all relevant aspects of workers' conditions and their relationship to safety and health. These data are obtained on the basis of a questionnaire that contemplates the different disciplines of occupational risk prevention and also provides data on the working conditions of each survey respondent in the demographic and the labour market.

The aim of this paper is to analyze the relationship between working conditions and the probability of experiencing an occupational accident, picking out individual variables from the ergonomic conditions of the employment post and the psychosocial aspects of the worker. Likewise, a search was conducted for the most significant variables, to observe their implication in the increase/decrease of the probability of an accident.

The investigation of occupational accidents is the search for factors that intervene in the genesis of accidents, seeking out causes and not guilty parties. The objective of the investigation is the prevention seeking to neutralize the risk from source or at its origin, refusing to assume that its consequences will be inevitable.

In the proposed model for the development of this research, which we will see below, various working conditions have been taken into account, covering multiple aspects related to the environment in which workers carry out their activities. 27 variables are integrated into the model to create the Bayesian network, but in order to obtain results, only those conditions related to ergonomics and psychosociology (6 variables) will be used. Next, the focus will be put on the bibliographic analysis of the variables related to these subjects and their effect on workers' health condition.

The ergonomic and psychosocial disciplines used in the present study are aspects that have been studied by different authors in relation to occupational accidents. Both ergonomics and the aspects related to psychosociology in the workplace have to be taken into account and integrated in the Health Risk Prevention Plans in the workplace [3] in order to improve the worker's health and safety conditions.

The recent literature review carried out by Hanvold et al. [4] shows that ergonomic factors along with psychosocial factors, such as the worker's autonomy and a safe environment, are associated with an increased risk of injury for young workers.

source: INSHT), the tendency coincides, but from 2013, the trend changes and the number of accidents increases (Figure 1):

1.1. Ergonomic Factors. Ergonomic factors are of great importance, not only in relation to the worker's own health and safety but also in other aspects associated with production. Ergonomic requirements are an essential element in the quality of the work that is performed according to the study developed by Górný [5]. It is also stressed that ergonomic variables have to be considered in the development of quality management plans, in order to guarantee acceptable conditions that will permit the completion of the tasks to the highest quality [6].

Sustained physical work can be the cause of bodily injury to workers, which in turn entails enormous losses to the industry in terms of money, time, and productivity. Several safety and health organizations have proposed rules and regulations that limit workers' efforts in order to mitigate possible bodily injuries [7]. However, physical efforts continue to cause serious damage to workers' health and, as a result, managers' efforts should be directed towards a more ergonomic and safe working environment [8].

In an analysis of the relation between ergonomics—accidentally, in the study of Saari et al. [9]—the experience of the worker in the workplace, (monotonous) repetition, and mobility in the workplace, were proposed as the variables most closely linked to the occurrence of accidents.

The study of ergonomically unacceptable working conditions completed by Kilbom and Broberg [10] concluded that women perform repetitive and monotonous tasks in manufacturing industry with greater frequency than men, which is apparent in injuries that principally affect the neck, the arm, and the shoulder.

One of the causes of higher accident rates, in developed countries, is linked to the increasing installation of machinery. Lack of protection on machines, poor maintenance, and inexperienced workers was reported as the principal factors in the occurrence of occupational accidents [11].

In the construction sector, the problems arising from personal equipment associated with the job, faulty equipment, and auxiliary aids, the suitability of the materials that are employed, and shortcomings in safety management have been linked to the occurrence of accidents [12–14].

The comparison of the ergonomics of positions of employment and their problems in different countries was examined by Bhattacherjee et al. [15] through a study of the working population of the mining sectors both in India and in France. In the Asian sample, most of the injuries took place due to handling of tools, materials, and machinery, as well as due to the problems linked to environmental variables. In France, the injuries appeared to be related with

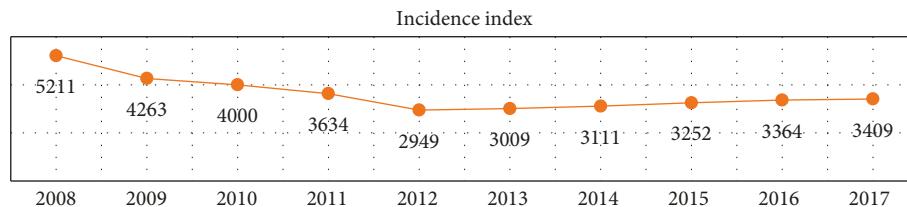


FIGURE 1: Incidence index of occupational accidents over the period 2008–2017. Source: “Anuario Estadísticas” MEYSS.

biomechanics, an aspect that is related with the age of the workers and their physical state. On workers in the United States, Bobick et al. [16] considered that musculoskeletal injuries were the most common and they concluded with the need to design the employment position, taking into account the physical consequences for the worker.

Related with the design of the post or work station, adopting inappropriate postures while working and the lack of safety preparation were shown to be the principal causes of accidents [17].

The association between workload and performance of public transportation drivers is analyzed in the study by Useche et al. [18], which supports a negative effect of workload on professional performance in relation to aspects such as traffic accidents and penalties.

1.2. Psychosocial Factors. The associations between psychosocial factors and sick leave, both due to illness and due to accident, have been examined through aspects related with the work environment, management quality in the firm, and the conciliation of work and family life, among others.

A working environment that implies placing high demands on people and that provides little supervision over the completion of tasks will limit self-esteem and will, therefore, provoke a stressful experience with adverse long-term health-related consequences [19]. Fatigue associated with a high workload, jobs with high psychological demands, and personal conflicts with fellow workers are risk factors to control in view of possible mishaps [20].

An aspect such as the autonomy when deciding the work schedule was manifested as an attenuation of the frequency of injuries. It also places work satisfaction and work-life balance as a mitigating factor for possible occupational accidents [21].

Managerial leadership appears as an element to take into account in worker pathologies of a psychosocial type [22]. In their article, Hinkka et al. [23] attributed a reduction in the risk of accidents, resulting in a sick leave to positive encouragement from managers, to a good working climate, and to recognition at work. Along the same lines, Giorgi et al. [24] considered that managers have to develop mechanisms for the detection and the supervision of the psychological health of their workers and specifically the stress that they undergo for the improvement of the conditions that cause it. In the study carried out by [25], the results support when risk management takes into account the psychosocial aspect of workers. There is also evidence

that there has been collaboration with workers to demonstrate that they are valued, among other factors.

The emotional conditions and the social relations of people are aspects that have some importance in the occurrence of accidents [26]. The study conducted by Kirschbaum et al. [27] concluded that there was a considerable probability of injuries when observing the type of employment position, the level of personal income, involvement in dangerous jobs, emotional concern, and poor living quarters. The existing relationship between work dissatisfaction and its consequences on worker’s health is demonstrated when a low satisfaction increases the levels of risk of injury. This correlation suggests the need for interventional methods to detect these kinds of situations [28].

The existence of bullying at work is another aspect that deteriorates the occupational satisfaction of bullied workers, with harmful consequences for the health of the worker [29, 30]. The state of satisfaction with the position of employment is revealed as a factor that diminishes the risk of involvement in an occupational accident, above all in jobs with greater specialist demands that have a direct effect on workplace injuries [31].

The influence of psychosocial conditions analyzed by gender yields as a consequence of very differentiated situations [32]. In small and medium firms, stress and workload generate high indices of association with accidents among men; nevertheless, scarce few relations with workmates and family are demonstrably the most significant factors among women.

The association between occupational risks and the perceived mental health of individuals is analyzed using the 5th European Working Conditions Survey (V EWCS). It is proven and stressed the need to act to improve the mental well-being of workers to minimize their exposure to states that could pose a risk to their health while at work [33].

Occupational stress is without a doubt one of the most extensive psychosocial consequences among the working population of developed countries and is, therefore, one aspect of prevention that is currently the subject of exhaustive studies [34].

The study of the exposure of the salaried working population in Spain to psychosocial risks between 2004 and 2005 highlighted poor leadership quality, emotional psychological demands, and possibilities of professional development as the most unfavourable for employee health [35].

Recently, the study conducted by Coupaud [36] on the analysis of psychosocial conditions associated with the health of workers in Europe over the period 2000–2015

showed a close relation between interpersonal relations and worsening health. Social support is important, both from superiors and peers. The risk of physical injuries increases significantly (3.5 times) among individuals with risk exposures and under the support of their supervisor, as compared to peers with low exposure and direct support [37]. According to the research work done by Morag and Luria [38], the development of group participation systems for risk prevention is positive.

2. Data

The data used in the present study were provided by the 7th National Survey of Working Conditions (VII NSWC), a survey completed in Spain by the National Institute of Safety and Hygiene at Work (INSHT), an organism reporting to the Ministry of Employment and Social Security. It was administered between 2011 and 2012, following the lines marked out by earlier editions, with the objective of contributing updated information on the working conditions of the different sectors into which the working population of Spain is grouped.

The survey covered a sample of 8892 workers (Table 1) interviewed at home through a questionnaire with a total of 62 questions [2]. The scope to which the survey was administered consisted of individuals aged over 16, in full-time employment, in all economic activities. The sample was distributed in accordance with the number of active employees according to the Active Population Survey average 2009 (EPA 2009) adapted to an initially foreseen sample of 9000 workers. Weighted coefficients were applied to adjust the sample to the situation described in the EPA 2009, which attempted to adjust some of the study groups to those figures.

The response to question Q-52 “Have you experienced an occupational accident over the past two years?” was considered essential to conduct the study. On the basis of the survey, 12 respondents gave no answer to this question, which explains the reduction in sample size from 8892 to 8880 workers. Neither were the abovementioned weighted coefficients applied.

The 27 chosen variables from the national survey were divided into six large groups that, together with the variables accident and sector, are presented in Table 2. The frequency of the responses from the workers was also included in accordance with the categories of each question under consideration. These categories were defined by the authors in such a way as to simplify the different responses that the survey respondents could select.

It should be noted that the questions raised in the groups relating to ergonomics and psychosociology implied multiple questions. The responses were therefore grouped on the basis of the coefficient “alpha’s Cronbach” [39, 40]. This coefficient is considered a measure of reliability that enabled us to group the responses to different interrelated questions under a single variable, by taking into account the different responses reflected in the same question. The values of this indicator can be anywhere between 0 and 1, with values between 0.70/1.00 reflecting acceptable/excellent reliability.

TABLE 1: Sector of activity and number of workers surveyed. Source: data VII NSWC.

		Survey respondents	Percentage (%)
Sector	Agrarian	457	5.1
	Industry	1448	16.3
	Construction	599	6.7
	Services	6388	71.8
	Total	8892	100.0

3. Methodology

The methodology based on probabilistic networks, known more specifically as Bayesian networks (BN), was chosen to conduct this study. They are described as “*combining graphs and probability functions to define probabilistic models in an efficient manner that contain the desired relations of dependency for a problem and that are computationally processed*” [41]. The BN infers the joint probability function (JPF) from the data, based on the dependency relations defined in the graph. This function employs algorithms to relate the probabilities between each other, some of which are based on the Bayes equation [42]. A characteristic of the BN and the “machine learning” methods is the possibility of implementing machine algorithms [43].

The sampling data, explanatory variables, and objective were all included in the knowledge base because there was no other way of inferring its probability, given factor (variable)-based evidence. Evidence is a defined value that is labelled a variable at a given point in time. This process is known as inference or probabilistic reasoning and is used to quantify the uncertainty of different problem-related variables as the evidence is introduced [41].

MATLAB software was used to generate the network, through a specially designed code with the MATLAB toolbox, known as METEOLAB (Meteorological Machine Learning Toolbox for MATLAB), designed by the Santander Meteorology Group (Santander.Met.Group).

The network that was generated to obtain the results was characterized by the definition of 29 variables related with the working conditions, including the variable V1 (accident) established as an objective variable for the purposes of this study. In this way and through the introduction of evidences linked to other variables (different categories are defined in each one), the probabilities of an occupational accident are computed as functions of the evidence/s that is/are introduced.

4. Model and Variables

4.1. Proposed Model. The Bayesian network was obtained by selecting the 29 selected variables, drawn from the responses to the survey questionnaire. They were likewise grouped according to six criteria:

- (i) Demographics: group data related with the geographic situation and personal data of the worker
- (ii) Labour market: data related to the type of contract and experience, including variables on the characteristics of the post

TABLE 2: Variables considered for the Bayesian network. Source: data of 7th NSWC.

Group	Variables	Categories			Observation	α -Cronbach	
Accident	V1	Yes 686	No 8194				
Sector	V2	Agrarian 456	Industry 1446	Construction 596	Services 6382		
	V3: geographical zone	North 2313	Mediterranean 2950	Centre 1753	South 1864		
	V4: age	≤ 34 years 2201	$34 < x \leq 44$ 2909	$44 < x \leq 54$ 2497	> 54 years 1261	DK/ NA 12	
Demographics	V5: educational studies	Primary 3158	Further ed. 3203	Higher ed. 2489	DK/NA 30		
	V6: nationality	Spanish 8059	Other 813	DK/NA 8			
	V7: gender	Man 4753	Woman 4127				
	V8: contract	Permanent 5285	Temporary 1858	Others/self-emp. 1733	DK/NA 4		
	V9: experience	≤ 2 years 1764	$2 < x \leq 6$ 2568	$6 < x \leq 12$ 2118	> 12 years 2406	DK/ NA 24	
Employment	V10: hours a week	≤ 38 h/wk. 2919	$38 < x \leq 40$ 3961	> 40 h/wk. 1906	DK/NA 94		
	V11: level of employment	Employee 6311	Management 1142	Director 1395	DK/NA 32		
	V12: hours	Flexi time 3468	Full time 3161	Shifts 2017	Others 221	DK/ NA 13	
	V13: staff	Micro <10 emp. 3935	SME 10–250 3693	Large >250 emp. 1252			
	V14: risk evaluation	Yes 2993	No 3971	DK/NA 1916			
Safety	V15: protective gear	Yes 2902	No 5204	DK/NA 774			
	V16: information	Yes 7653	No 1118	DK/NA 109			
	V17: training	Yes 5164	No 3613	DK/NA 103			
	V18: noise	Yes 3164	No 5657	DK/NA 59			
	V19: vibrations	Yes 1249	No 7601	DK/NA 30			
Hygiene	V20: haz. rays/waves	Yes 746	No 8099	DK/NA 35			
	V21: toxins	Yes 1347	No 7510	DK/NA 23			
	V22: smoke (environ.)	Yes 1465	No 7388	DK/NA 27			
	V23: infection	Yes 649	No 8148	DK/NA 83			
Ergonomics	V24: physical effort	Always 24	Often 262	At times 1767	Rarely 4527	Never 2300	Multiple choice 0.764
	V25: workload	Always 403	Often 2667	At times 3794	Rarely 1855	Never 161	Multiple choice 0.70
	V26: social support	Always 3704	Often 1615	At times 1598	Rarely 660	Never 1303	Multiple choice 0.77
Psychosocial	V27: personal development	Always 3021	Often 2996	At times 1852	Rarely 779	Never 232	Multiple choice 0.798
	V28: independence at work	Always 1952	Often 1671	At times 2167	Rarely 1652	Never 1438	Multiple choice 0.902
	V29: concerns	Always 2882	Often 4092	At times 1506	Rarely 369	Never 31	Multiple choice 0.902

DK/NA = do not know/no answer; SME = small and medium enterprise; Haz = hazardous.

- (iii) Occupational safety: safety conditions of the post
- (iv) Occupational hygiene: external conditioners that are present in their post
- (v) Ergonomics of the post: physical and emotional effort demanded for the completion of the work
- (vi) Work-related psychosociology: conditioners related to the satisfaction of the worker with regard to the position of employment and the social surroundings

In this way, a model is built to generate the network (Figure 2), and subsequently, evidencing certain variables in accordance with the model, the probability of an occupational accident is obtained in relation to the variables under consideration. The results related to the variables that are considered alongside the occupational accident rate across the sector of activity will also be obtained.

4.2. Study Variables. As it was earlier indicated, the purpose of this work is to attempt to obtain the relation between accident probabilities (V1) and the variables of both the ergonomics and the psychosociology groups (Figure 3).

In what follows, we will define the 6 variables corresponding to the two groups of study and all of them will categorized on a 5-point Likert-type scale.

4.2.1. V24: Physical Effort of the Post. This variable summarizes the multiple responses to Q-28 of the questionnaire (Table 3). Many aspects of the design of the position of employment corresponds to the question “*how frequently are you exposed to ...?*”. The following situations were proposed.

In view of the frequencies obtained after grouping the variable values, it was decided not to use the response “*always*,” given the scarce few times it was used and the results of which would suppose a low statistical significance (Table 2).

4.2.2. V25: Workload. In a similar way to the earlier variable, Q-30 has nine response options (Table 4), as optional responses to the question “*how frequently do you have to ...?*”. The following situations were proposed.

4.2.3. V26: Social Support. Q-31 of the survey attempts to reflect the worker-related social environment with workmates and managers through a series of questions under the same heading, “*how frequently do you ...?*”, and offers a series of options that can be divided into two parts, on the one hand, making reference to the support of managers and workmates (Table 5), and on the other hand, to aspects related with the personal development of the worker (Table 6).

4.2.4. V27: Personal Development. The second block of questions included in Q-31, corresponding to the personal development of the worker (Table 6), similar to the concept

of “*Empowerment*” in the Anglo-Saxon world, set out the following situations.

4.2.5. V28: Autonomy. Among the circumstances that surround the worker at his post are the opportunity of changing the development of the working activity and thereby collaboration in the decisions. Q-32 proposes four possibilities (Table 7).

4.2.6. V29: Concerns. There are different aspects of the study that can generate concern among workers, which is why knowledge of those aspects for their analysis is appropriate in this piece of work. Q-55 of the survey has a direct impact on those situations that might be a cause of concern for the worker (Table 8). It sets out 18 causes that might generate problems.

5. Bayesian Network

5.1. BN Graph. Having introduced the totality of the variables selected in the survey and having generated the resulting network, we can observe variable V1 (accident) in the upper zone of the graph and its relations with different network variables and the rest of the variables placed in an anticlockwise direction (Figure 4).

Among the variables under consideration for this study, only two of them are “directly linked” in the graph of the Bayesian network with variable V1 (accident), which gives them a stronger tie of dependency (Figures 4 and 5):

- V24: physical effort of the post
- V27: personal development (empowerment)

5.2. BN Validation. The validation of the Bayesian network was done through the measurement of the area under the ROC curve (AUC—area under the ROC curve). The analysis of receiver operating characteristics (ROC) is displayed on a graph, in other words, in the bidimensional representation of the points resulting from the application of two measurements. In the sensitivity (S) ROC graphs, the true positives are represented on the Y-axis and 1-specificity (1-S) on the X-axis, in other words, the ratio of false positives. A ROC graph represents the relative scale between benefits (real positives) and costs (false positives), thereby modifying the decision-making threshold [44].

The calculation of ROC is a widely used index that summarizes the behaviour and the precision of the classifier [45], thereby validating the data that were collected. The methodology evaluated the capacity that these variables have in predicting the occurrence of an accident in the workplace, in such a way that the figures attached to accident probability are reliable.

The AUC measurement was done through a cross validation for which the AUC values were obtained for the prediction of each subset under consideration and for the prediction of the whole sample by merging the predictions of each subset [46].

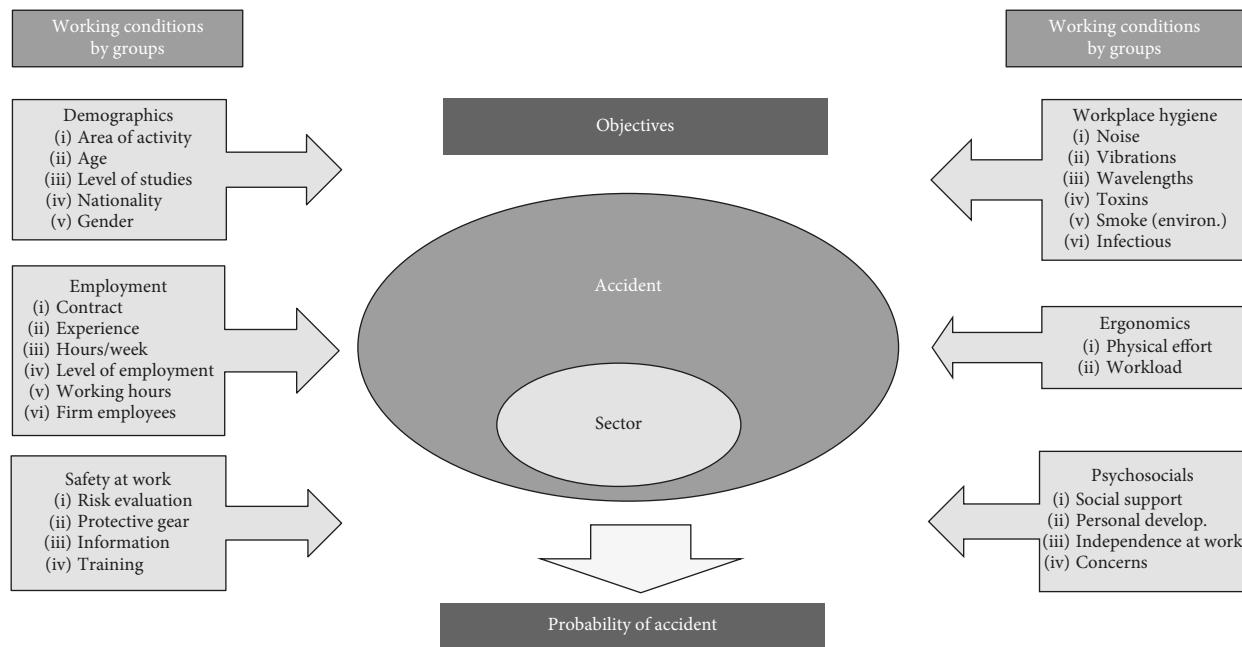


FIGURE 2: Proposed model. Source: authors.

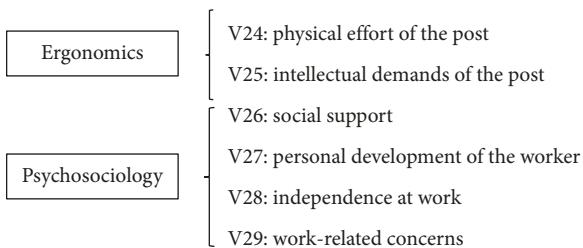


FIGURE 3

TABLE 3: Options Q-28 7th NSWC.

1	Adopting painful and tiring postures (any part of the body: shoulder, head, arms, hands, etc.)
2	Standing up without walking
3	Seated without standing up
4	Lifting or moving heavy weights
5	Lifting or moving people
6	Applying significant force
7	Repeating the same movements of hands and/or arms
8	Little space available to work comfortably
9	Having to reach out for tools, work-related items, or objects placed at very high or very low levels or that means stretching out an arm
10	Inappropriate lighting for the job that is done (scarce, excessive, with irritating reflections, etc.)
11	Working on unstable or irregular surfaces

MATLAB software was used to perform the validation task of the network that was generated, through a code programmed for that purpose by the Santander Meteorology Group [47]. This code was implemented to carry out the evaluation of the network by applying a *k*-fold cross validation. In this method, the sample is divided into ten equal parts (*k-fold* = 10) in such a way that one of those 10 parts

TABLE 4: Options Q-30 7th NSWC.

1	Maintain a high or very high level of attention
2	Work very quickly
3	Work to strict and very short deadlines
4	Attend to various tasks at the same time
5	Deal directly with people outside your firm: clients, passengers, students, patients, etc
6	Complete complex, complicated, and difficult tasks
7	Complete monotonous tasks
8	Work with computers: PC, networked computers, central computers, etc
9	Use internet/e-mail for professional purposes

TABLE 5: Options Q-31 7th NSWC.

1	Can obtain help from workmates, if requested
2	Can obtain help from directors/managers, if requested

TABLE 6: Options Q-31 7th NSWC.

1	Opportunities at work to do what you know how to do best
2	Can put into practice ones' own ideas at work
3	The sensation of doing a useful job
4	Can learn new things

behaves as a validation set, leaving the rest (90%) as a training set, and this process is repeated with each partition of the initial set. In this way, given that the collected sample is made up of 8880 items, the ROC measurement is done in ten iterations, considering the training sample of 7992 items and its validation with 888 items.

Having completed the validation process, an average of 0.816 was obtained for the prediction that an accident might take place using the proposed network.

TABLE 7: Options Q-32 7th NSWC.

1	The order of the tasks
2	The working method
3	The pace of work
4	The distribution and/or duration of pauses in the work

TABLE 8: Options Q-55 7th NSWC.

1	Independence at work
2	The pace of work
3	The working hours
4	The difficulty or complexity of the tasks
5	Monotony
6	The quantity of work
7	Relations with workmates
8	Relations with managers
9	Relations with other people outside the firm: clients, passengers, students, patients, etc
10	The attitudes that should be adopted
11	The physical effort that has to be made
12	The noise levels in the workplace
13	Lighting of the workplace
14	Temperature and humidity in the workplace
15	Manipulation or intake of harmful or toxic substances
16	Risk of accident
17	Risk of illness
18	Risk of redundancy

6. Results

A study on accident probability has been completed with evidence on the six variables selected from the 7th NSWC database, as well as on the sector of activity.

At first, the probability of each variable independently showing the accident probabilities by the categories of each variable is obtained. The analysis of the highest probabilities obtained from the variables considered through the production sector will also be carried out.

Then, two variables that are in a direct relation of dependency with the variable V1 (accident) will be examined, followed by a breakdown of the results by sector of activity.

6.1. Sensitivity Analysis of a Variable. The results of this sensitivity analysis are shown in Table 9. The probability of a workplace accident was “*a priori*” around 7.38%, a result generated by the network formed of 27 independent variables, the accident probability, and the production sector. Applying the methodology described on the study variables (ergonomic and psychosocial), we obtain results of accident probability in each one of its categories.

The results obtained by the ergonomic variables show that, in the physical demands variable (V24), the range of probability values was somewhere between 16.59% of respondents who stated feeling this factor “*often*”, as opposed to 3.48% who “*never*” support these situations.

However, workload (V_25) was not shown to have a high influence on the probability of involvement in an accident,

fluctuating between 7.74% and 6.88%, and even showing values contrary to those initially foreseen.

With regard to the psychosocial variables, their values are not especially high for an increased probability of an accident. However, the network indicated an important relation of dependency on variable V27 (personal development) with variable V1 (accident). The values fluctuated between 8.69% in the case of it happening “*rarely*”, as opposed to 6.74% in the situation “*always*”.

The support of managers and workmates in no way implied substantial variations in the probability of an accident, moving within intervals of +0.55 and -0.80 with regard to the initial probability.

The worker’s independence variable (V28) shows an increase in probability, in the case of not having such possibilities, up to 8.72%, and on the contrary (“*always*”) around 6.46%.

It is also notable that the concerns with regard to the development of the work (V29) increase the probability of accident by up to 9.77% in the case of the workers who consider themselves “*quite*” concerned and falling to 6.34% in the situation of “*not at all*” concerned.

Once the results of the variables have been obtained individually, their impact on the different production sectors is shown in Table 10. The physical demands of work range from an “*a priori*” increase in probability of 2.79% in the agricultural sector to 9.47% in industry.

Labour demands generate small increases in accident probability, between 0.23% and 0.55% in services and industry sectors, respectively.

Social support in both the agricultural and the industrial sectors represents the highest probability increase with 0.80% and 0.85%. In construction, however, it is only 0.30%.

The obtained results, taking into account the worker’s own personal development, means that, in the industrial sector, the probability increases by 2.29% and the lowest percentage or smallest increase occurs in the service sector with only 0.89%. Autonomy at work gives similar values in a range between 1.99% and 0.86% in industry and services, respectively.

Finally, work-related concerns show a higher increase in the probability in the construction sector with 3.01% and a smaller growth in services with 2.03%.

6.2. Sensitivity Analysis of Two Variables/Sector. As mentioned above, there are two variables (V24–V27) that show a direct relationship with the target variable (V1) through the network and by performing a sensitivity analysis of these two variables, and the values reflected in Table 11 are obtained. In order to obtain results, the two extreme situations (always–never) of variable V27 (personal development) of the worker have been proposed in order to be able to observe the degree to which it influences, as a mediating factor, the increase or decrease in the probability generated by the physical demands of the work.

Analysing those same factors filtered by the sector of activity of the workers in the survey yields, the values are shown in Table 11.

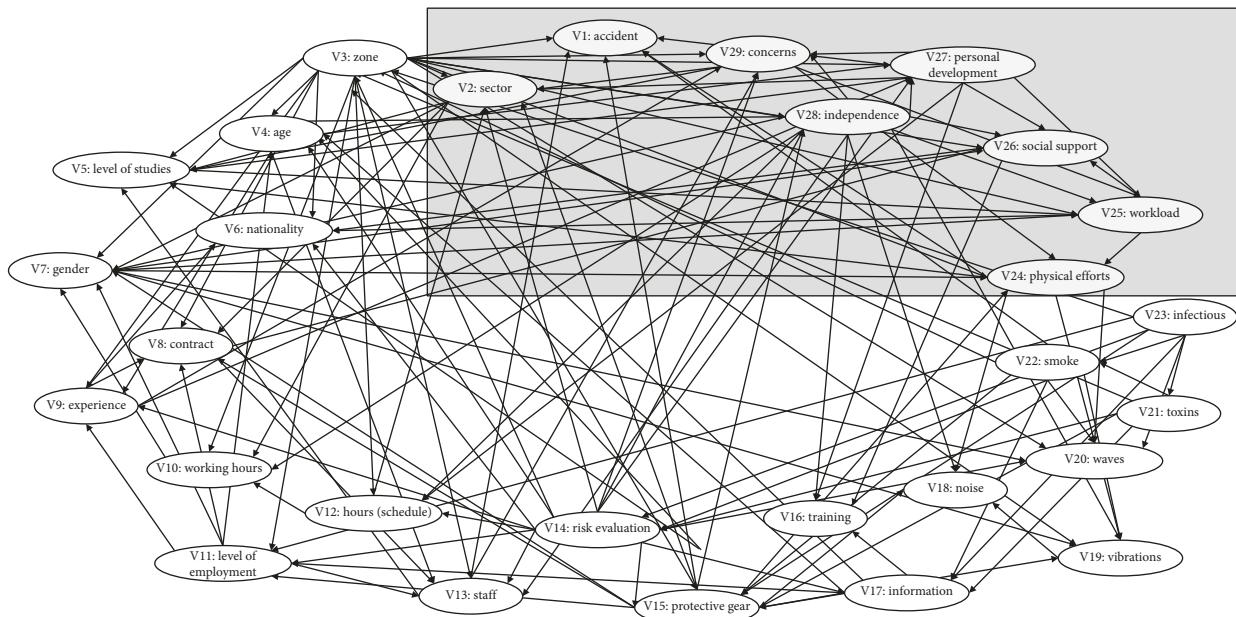


FIGURE 4: Graph of the Bayesian network. Source: authors.

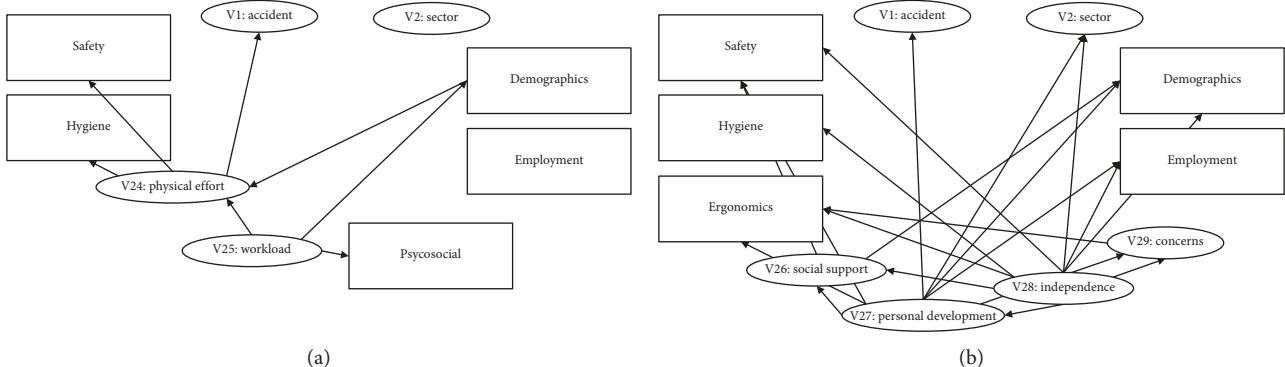


FIGURE 5: Graph of the Bayesian network. Source: authors.

In those cases for which it was possible to perform a calculation, it can be seen that the probabilities of an occupational accident on the basis of two pieces of evidence reflect interesting results. The influence on this probability of variable V27 (personal development) (empowerment) assumes enormous importance when included in the situation of high physical effort demanded from the worker, differentiating between the situation of job satisfaction and its absence (*never*). The probability of an accident was in any case high; in the case of never having had the possibility of personal development in the workplace that same probability rose to 49.36%.

Likewise, the probabilities in the other cases reflect significant differences when the situation of job satisfaction is or is not present, except in the case of rarely making physical effort.

By production sectors, the services sector was the one with the highest probability of workplace accidents in jobs with high physical effort and the impossibility of personal development (satisfaction) of the worker, reaching 64.28%.

The other sectors made it clear that the highest probabilities were found within an intermediate degree of physical effort together with the inexistence of personal satisfaction in the workplace, varying between 18.16% in industry to 30.40% in construction work.

7. Discussion

Based on the studied variables, the results elucidate interesting conclusions. The BN graph indicates that the two variables directly related with V1 (accident) are V24 (physical effort) and V27 (personal development).

Considering 7.38% as an initial accident probability, the values that marked out the different variables can be observed to occupy tight margins, except for posts with high physical effort (+9.21%). This variable shows a clear relationship of dependence with the variable V1 (accident). It should be noted that the category “*always*” has not been taken into account in the results due to the low number of cases of this type.

TABLE 9: Sensitivity analysis of a variable. Source: authors.

Variable	Label	Categories	% ACC	% VAR
V24	Physical effort	2—often	16.59	9.21
		3—sometimes	11.86	4.48
		4—not often	7.32	-0.06
		5—never	3.48	-3.90
V25	Workload	1—always	6.88	-0.50
		2—often	6.73	-0.65
		3—sometimes	7.74	0.36
		4—rarely	7.68	0.30
V26	Social support	5—never	7.02	-0.36
		1—always	7.36	-0.02
		2—often	7.67	0.29
		3—sometimes	7.51	0.13
V27	Personal development (empowerment)	4—rarely	7.93	0.55
		5—never	6.58	-0.80
		1—always	6.74	-0.64
		2—often	7.40	0.02
V28	Independence	3—sometimes	8.02	0.64
		4—rarely	8.69	1.31
		5—never	8.04	0.66
		1—always	6.46	-0.92
V29	Work-related concerns	2—often	6.64	-0.74
		3—sometimes	7.49	0.11
		4—rarely	7.97	0.59
		5—never	8.72	1.34
V29	Work-related concerns	1—none	6.34	-1.04
		2—a little	7.49	0.11
		3—regular	8.75	1.37
		4—quite a lot	9.77	2.39
		5—a great deal	7.73	0.35

TABLE 10: Sensitivity analysis of a variable and sector. Source: authors.

Variables	Category	Sector				
		Total (%)	Agrarian (%)	Industry (%)	Construction (%)	Services (%)
V24	Physical effort	2 Often	16.59	12.31	19.33	17.08
V25	Workload	3 Sometimes	7.74	9.92	10.41	10.33
V26	Social support	4 Rarely	7.93	10.32	10.71	10.28
V27	Personal development (empowerment)	4 Rarely	8.69	10.82	12.15	11.50
V28	Independence	5 Never	8.72	11.49	11.85	11.62
V29	Work-related concerns	4 Quite a lot	9.77	12.07	12.76	12.99

*“A priori” total and by sector accident probability values.

Musculoskeletal injuries generate an enormous number of days off sick and the onset of professional illnesses that can increase the possibility of accident [7]. If to those we add that age has a negative influence on the physical capabilities of the worker, then the probabilities of an accident increase.

However, the demands of the work (V_25) do not show to have a high influence, showing values contrary to what was initially predicted. Analysing a single evidence, the probabilities obtained by ergonomics variables show that, although it seems that the demands of the work in relation to the times of completion of the work, tight deadlines, etc. are factors that we assume to be of importance in the appearance of accidents, the data extracted indicate that they do not have as much influence as physical efforts, the adoption of uncomfortable postures, repetition of movements, etc.

Regarding the psychosocial factors, the different categories of these variables generate no great differences with respect to the initial probability, although it was evident that the most unfavourable situations for the worker caused the highest accident-related probabilities: impossibility of self-development, no independence, low support, and deep concerns.

The analysis by sector indicates that the physical demands of the job clearly mark the maximum probability of accident with increases of 9.47% in the industry. This sector is the one that shows the greatest increases in all the variables studied above the rest.

When the two variables that the network directly relates with the target variable are examined, the importance of the psychosocial aspects in the increase/reduction of the probability of workplace accidents is highlighted. The

TABLE 11: Sensitivity analysis two variables and sector. Source: authors.

V24 (physical effort)	V27 (personal deviation)	Variables		Sector		
		Total (%)	Agrarian (%)	Industry (%)	Construction (%)	Services (%)
Often	Always	12.23	14.44	12.52	11.71	12.00
	Never	49.36	—	—	—	64.28
Sometimes	Always	10.72	5.57	10.83	8.68	11.39
	Never	14.88	28.72	18.16	30.40	10.40
Rarely	Always	7.55	10.94	9.01	9.76	7.00
	Never	6.50	6.03	9.57	—	5.99
Never	Always	2.73	2.13	3.84	3.56	2.55
	Never	5.05	14.02	5.65	24.06	4.10

intervention of supervisors and their leadership is an aspect which makes a big impact in the appearance of these risks and above all in their detection in order to minimise the effects on the worker's health [48].

The similarity of high/medium physical effort and a low level of personal development raise the probabilities to levels that warn the need to treat those aspects with special care. In the same way, the observation is worth making that high levels of satisfaction among workers in the workplace imply significant falls in the probable occurrence of accidents, above all in the service sectors [49]. This trend is repeated to a lesser extent in the agrarian and the construction sectors.

8. Conclusions

In first place, the importance should be highlighted of the data collected by National Survey on Working Conditions (NSWC), organized by the INSHT in Spain, for the investigation of aspects related to the prevention of occupational accidents. Reflecting the characteristics of the employment panorama in each period is of great interest for scientific studies in different branches related with the reality of the job market and its links with economic periods.

Likewise, the application of Bayesian networks widely used in various current areas of research (medicine, ecology, traffic, safety, and prevention), demonstrates its great effectiveness at the computation of probabilities that are conditional upon an event. In the case of the present study, these events are accidents, and the BN network allows us to analyze changes in the probability of such an event happening even due to other factors.

In the field of ergonomics, the physical demands of work are shown as the most determining variable in the increase in accident probability above the rest with a probability that reaches 16.59% and represents an increase of 9.21% over the initial one. It is true that the production processes and manual tasks have been focused on better welfare of the worker, but these results show that there is still room for improvement. A broader and more specialized study on the development of aspects related with physical effort is necessary, so that effort is minimized and in consequence, any health risks will be kept as low as possible. This aspect is particularly evident in the industrial sector, which generates the highest probability of suffering an accident at work. This particular sector needs to be further studied in order to promote measures to reduce workers' exposure to this type of risk.

In the field of psychosociology, the possibility of the worker doing what that worker is best at doing, being able to put into practice one's own ideas, and having the satisfaction of making something useful are revealed as conditioners that are reflected in the probability of the occurrence of an accident. In those situations where the worker is ignored, the probability increases by up to 8.69%. Evidently, this result has a lot to do with the personal satisfaction of the individual and the growth of that individual as a person, aspects which the current business leadership typologies would do well to take into account.

However, when high physical effort and low worker empowerment are added into the equation, the probability of accident rises sharply and action on these matters should be taken on various fronts. The inclusion, in business protocols, of techniques for the detection of psychosocial problems would also be recommended. Likewise, as previously indicated, the quality of management leadership is clearly needed to achieve sufficient motivation and the satisfaction of the worker in the workplace.

The implementation of measures for the knowledge of the satisfaction of workers in their job and providing mechanisms to raise the morale of staff with respect to their work is considered one of the measures to be applied in existing companies, especially in the industrial sector.

As in every other research paper, there are limitations that affect the current one as well. In this case, the data are obtained from a survey of workers. The data on reported accidents are provided by employees without being reflected in accident reports processed (sick leave) by the administration. This extreme results in a lack of data on severity, duration of sick leave, etc.

The population sample in the survey reflects the productive panorama of the country at that time, but the evolution of economies and labour markets means that it is in constant change. It is advisable to carry out subsequent studies adopting these changes. Accordingly, in the future, new studies are expected to be carried out by analysing subsequent surveys and comparing the results in order to record the evolution of working conditions and their effects on workers' health.

Data Availability

The documentation and data used in this study (7th NSWC), previous form, can be found available on the website of the Spanish National Institute for Occupational Safety and

Health at Work (INSHT) at <http://encuestasnacionales.oect.es/>. At the same time, through this URL you can consult online the data related to the survey and its questionnaire.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Research Article

Psychosocial Predictors of Bruxism

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Objectives. The study aimed to investigate the psychosocial predictors of bruxism. The association of various psychosocial factors such as alexithymia, emotional processing, state and trait anxiety, and stress with awake bruxism was analysed. **Methods.** The study involved 52 volunteers diagnosed with awake bruxism. The toolkit that was used included the Toronto Alexithymia Scale (TAS-20), the Emotional Processing Scale (EPS), the Cohen Perceived Stress Scale (PSS-10), and the State- and Trait-Anxiety Inventory (STAI), with independent individual psychological diagnoses being made for every patient. The results were statistically analysed using IBM SPSS Statistics 24. **Results.** The obtained data clearly show that psychological traits—both permanent dispositions (e.g., state anxiety and alexithymia) and temporary states (e.g., trait anxiety, emotional processing deficits, and psychological stress)—are significant determinants of awake bruxism. The percentage of explained variance indicates the presence of other factors as well. **Conclusions.** Psychosocial factors such as state anxiety and trait anxiety, alexithymia, and perceived stress are as important as somatic causes in the occurrence and maintenance of awake bruxism. The profile of the obtained data suggests the possibility of preventing or minimizing the symptoms of awake bruxism through properly constructed psychoprophylactic interactions.

1. Introduction

Bruxism, a repetitive activity of masticatory muscles characterized by grinding or clenching the teeth, can occur during sleep (sleep bruxism(SB)) or during wakefulness (awake bruxism (AB)). Recently, the definition of bruxism was corrected by Lobezzo et al. [1]: SB is a masticatory muscle activity during sleep (characterised as rhythmic and nonrhythmic); awake bruxism is a masticatory muscle activity during wakefulness (characterised by repetitive or sustained tooth contact and/or by bracing or thrusting the mandible). In otherwise healthy individuals, bruxism should be considered as a behavior that can be a risk factor for certain clinical consequences [2]. The epidemiologic characteristics of bruxism are not clear due to different

diagnostic strategies and the investigation of nonrepresentative populations [2, 3]. The prevalence of “sleep bruxism” varies from 9.3% to 15.9% and the prevalence of “awake bruxism” varies from 22.1% to 31% in the adult population [3–9]. The prevalence of generally identified “bruxism” has been reported in 8% to 31.4% of the population [10, 11]. It is believed that the presence of comorbid conditions, such as other psychological diseases, may influence the assessment of bruxism’s prevalence [3].

Although widespread among populations and repeatedly investigated, bruxism remains an enigmatic disease with many of its aspects requiring further scientific evaluation [12–14]. Bruxism is considered to be a multifactorial disorder [12, 15–22], and its aetiology is not well defined. Various factors, i.e., tooth interference in dental occlusion

[23, 24], sleep arousal episodes [25, 26], central nervous system-associated causes involving neurotransmitters and basal ganglia [15, 27–29], and side imbalances in striatal D2 receptor bindings [29], have been identified as related to bruxism. Some studies suggest the possible involvement of genetic factors in the pathogenesis of bruxism [13, 30, 31]. Various psychosocial factors associated with bruxism have also received much attention in the literature. A number of studies have shown a relationship with bruxism of certain personality traits (e.g., aggression or emotional suppression) [1, 15, 31–34], psychosocial factors (e.g., perceived time pressure or competition) [35, 36], and psychological stress (cf. stressful lifestyle) [8, 35–39]. Anxiety and neuroticism personality traits have especially been reported in individuals with bruxism [1, 38–41]. By inference, bruxism is supposed to be induced centrally, with the somatic effects found in the stomatognathic system (i.e., muscle tenderness, limitation of jaw movements, oral and facial pain, headache, and tooth wear or fracture) [14]. Regardless of the definition, bruxism, being a somatic symptom disorder, is related in time with stressful events or problems. Nonetheless, the literature does not provide a definite conclusion whether bruxism is associated with psychological dispositions or transient states of a psychosocial character. Therefore, the aim of the present study was to investigate whether various psychosocial factors such as alexithymia, emotional processing deficits, and anxiety and stress correlate with bruxism.

2. Materials and Methods

2.1. Investigated Group. The subjects of this study were 54 first-visit patients (38 women, 16 men) who visited the Department of Temporomandibular Disorders because of tooth wear and feeling of facial tiredness. The patients underwent routine examination procedures including a bruxism questionnaire and an RDC/TMD questionnaire. Additionally, during examination, the following data were gathered: tooth wear (using Martin's tooth wear index), vertical enamel fractures in the anterior teeth, indentations along the lateral borders of the tongue (tongue scalloping), and maceration of the buccal mucosa at the level of the bite line (linea alba).

Bruxism assessment: both awake and sleep bruxism were examined on the basis of a self-reporting questionnaire. The bruxism questionnaire contained five questions giving 3 possible answers to patients: yes/no/I do not know.

- (1) Are you aware of the fact that you clench your teeth when awake?
- (2) Do you have your jaws thrust on morning awaking?
- (3) Do you grind your teeth when awake?
- (4) Are you aware of the fact that you grind your teeth when asleep?
- (5) Has anyone told you that you grind your teeth when asleep?

Afterwards the patients were interviewed and received a clinical examination according to the criteria described by

Peasani et al. [42] and taking into consideration the results of Lavinge et al. [43]. The patients were examined by two clinical specialists in temporomandibular disorders working at the Department.

- (1) Awake clenching: positive history of tooth clenching when awake confirmed by the patient during interview and at least two of the following signs/symptoms: pain during palpation in one masseter muscles site per side (RDC/TMD), hypertrophy of masseters, presence of linea alba, and tongue scalloping
- (2) Awake grinding: positive history of tooth grinding while awake confirmed by the patient during interview along with the following clinical findings: noticeable tooth wear on the incisal surfaces of the anterior teeth or/and on the guiding cusps of the posterior teeth
- (3) Sleep clenching: positive history of tooth clenching during sleep confirmed by the patient during interview and at least two of the following signs/symptoms: pain during palpation in one masseter muscles site per side (RDC/TMD), hypertrophy of masseters, presence of linea alba, and tongue scalloping
- (4) Sleep grinding: positive history of tooth grinding during sleep confirmed by the patient during interview along with the following clinical findings: noticeable tooth wear on the incisal surfaces of the anterior teeth or/and on the guiding cusps of the posterior teeth

This method was used as we considered that the interview along with a clinical assessment of the most probable bruxism-related signs and symptoms may be sufficient to diagnose bruxism.

Finally, 52 patients were diagnosed with awake bruxism and 2 with sleep bruxism.

The psychological assessments only included the 52 people with awake bruxism (36 women, 16 men).

2.2. Method. The University Bioethical Committee (Decision 1198/17) approved the study protocol.

The one-stage study took place during the patient's second visit to the clinic, between November 2017 and May 2018, in a specially arranged room in the presence of a psychologist. Prior to participation in the study, the patients expressed written, informed consent. Then, the patients completed a "pencil and paper" research toolkit containing the Toronto Alexithymia Scale (TAS-20), the Emotional Processing Scale (EPS), the Cohen Perceived Stress Scale (PSS-10), and the State- and Trait-Anxiety Inventory (STAI). The mean time for this part of the study was 30 mins. Based on the results obtained, independent individual psychological diagnoses were made for every patient. The diagnosis included the characteristics of the patient's functioning in terms of the traits studied. The diagnoses were made available to the participants by e-mail.

2.3. Measurement

- (1) The Toronto Alexithymia Scale 20 (TAS-20) [44] measures alexithymia. Alexithymia refers to a phenomenon in people who have trouble identifying and describing emotions and who tend to minimize emotional experiences and focus attention externally. The TAS is a 20-item instrument. The scale has three measuring subscales: Difficulty Describing Feelings Subscale (e.g., "I am often puzzled by sensation in my body"); Difficulty Identifying Feeling Subscale (e.g., "It is difficult for me to find the right words for my feelings"); and Externally Oriented Thinking Subscale (e.g., "I find an examination of my feelings useful in solving personal problems (reverse keyed)"). Items are rated using a 5-point Likert scale whereby 1 = strongly disagree and 5 = strongly agree. The total alexithymia score is the sum of responses to all 20 items, while the score for each subscale factor is the sum of the responses to that subscale.
- (2) The Emotional Processing Scale (EPS) [45–47] is a 25-item questionnaire designed to identify emotional processing styles and potential deficits. The EPS uses five subscales of five items each to generate a total emotional processing score. The subscales are as follows: Suppression (e.g., "I smother my feelings"); Signs of Unprocessed Emotion (e.g., "Unwanted feelings keep intruding"); Controllability of Emotion (e.g., "I react too much to what people say or do"); Avoidance (e.g., "I try to only talk about pleasant things"); and Emotional Experience (e.g., "My emotions feel blunt/dull"). Items were rated using a 10-point Likert scale whereby 0 = completely disagree and 9 = completely agree. The total emotional processing score is the sum of responses to all 25 items, while the score for each subscale factor is the sum of the responses to that subscale. If the total for each subscale sum is high, the deficit is interpreted as more intensive.
- (3) The Perceived Stress Scale (PSS-10) [48, 49] (PSS-10 is distributed in Poland by the Psychological Test Laboratory of the Polish Psychological Association (<https://www.practest.com.pl/npsr-narzedzia-pomiaru-stresu-i-radzenia-sobie-ze-stresem>)) measures the perception of stress in the last month. A total of 10 items produced a PSS score. It was possible to indicate two subscales on the basis of factor analysis: perceived helplessness (5 items) and perceived self-efficacy (4 items) [49]. The participant evaluates the items, on a 5-point Likert scale, as to how often the described situations happen, from 0 = "never" to 4 = "very often."
- (4) The State-Trait Anxiety Inventory (STAI) [50–52] measures anxiety identified as temporary state connected with a situation and anxiety identified as stable trait connected with personality. The inventory has two parts: X-1 for measuring state anxiety and X-2 for measuring trait anxiety. Each of

the parts has 20 items. The participants used a 4-point Likert scale for state anxiety from 1 = "not at all" to 4 = "very much so" and also a 4-point scale for trait anxiety from 1 = "almost never" to 4 = "almost always."

The results were statistically analysed using IBM SPSS Statistics 24.

3. Results and Discussion

The first step used descriptive statistics to analyse the data. Table 1 shows the maximum and minimum, mean, standard deviation, Cronbach's alpha, and Shapiro-Wilk test's values for all variables. The reliability of the individual tools was acceptable except for the externally oriented thinking subscale in alexithymia. The results obtained in the Shapiro-Wilk test indicate a deviation from the normal distribution for some variables, and therefore, nonparametric tests were dedicated to them. The next step used r-Pearson's and rho-Spearman's correlation for investigation of the specific relationships between measured variables (Table 2).

For all the emotional deficits measured in the study, positive correlations were observed, but their strength varied. The strongest correlation was between alexithymia and emotional processing and explained ca. 49% of variation; the weakest one was between alexithymia and perceived stress as it only explained 7%.

In the next step of analysis, the results were compared to normalized data. We based this on English norms for alexithymia because there are no Polish norms for TAS-20 yet (cf. Association for Contextual Behavioral Science, https://contextualscience.org/TAS_Measure#).

As far as we know, alexithymia and emotional processing as possible predictors of bruxism have never been studied before. It has been suggested that bruxism is related to mood disorders and may also be associated with stable individual differences regarding the tendency to experience negative emotions [41]. We identified that 62% of patients were nonalexithymic, 15% of them in whom alexithymia was possible, and 23% of patients who revealed alexithymia. The difference in numbers is statistically significant ($\chi^2 (2, N = 54) = 19.07; p < 0.01$). The observed frequency of alexithymic patients is twice as high as indicated in the epidemiological data. Alexithymia is estimated at 10–13% in the general population. Accordingly, it is 12.8–17% in male groups and 25% in our study, and 8.2–10% in female groups and 21% in our study.

For emotional processing, Student's *t*-test was used for the group. The data were related to standardized data in the Polish population [46]. Tests showed that the patients had statistically significant lower deficits in emotional processing ($M = 3.35; SD = 1.51$) than the general population ($M = 3.9; SD = 1.5$) ($t(52) = -2.6; p < 0.05$). This suggests that patients with bruxism process emotions quite effectively.

In our study, the Stens scale was used for perceived stress [49]. This showed that ca. 81% of patients manifested a high level of stress and 19% with an average level ($\chi^2 (1, N = 54) = 38.44; p < 0.001$). Nobody showed a low level.

TABLE 1: Descriptive statistics.

Variable	Min	Max	M	SD	α	Shapiro-Wilk test W	p
Total alexithymia	25	71	48.59	12.59	0.85	0.96	0.105
Difficulty describing feelings	5	23	13.67	4.87	0.80	0.95	0.066
Difficulty identifying feelings	7	29	16.67	6.34	0.79	0.94	0.020
Externally oriented thinking	9	29	180.26	4.41	0.32	0.98	0.456
Total emotional processing	0	7.36	3.35	1.51	0.92	0.98	0.686
Suppression	0	7.8	3.38	2.08	0.89	0.97	0.313
Unprocessed	0	9.0	4.50	2.21	0.88	0.97	0.533
Controllability	0	6.4	3.26	1.59	0.68	0.97	0.356
Avoidance	0	6.4	3.41	1.69	0.64	0.95	0.043
Experience	0	7.80	2.19	1.67	0.80	0.93	0.012
Total perceived stress	14	31	22.92	3.85	0.87	0.98	0.782
Perceived helplessness	1	19	10.58	4.28	0.87	0.96	0.178
Perceived self-efficacy	5	16	10.31	2.74	0.69	0.97	0.330
State anxiety	22	58	38.05	9.24	0.92	0.92	0.005
Trait anxiety	25	66	41.98	9.64	0.91	0.95	0.037

These data showed stable associations between bruxism and stressful life styles observed in other studies where bruxism has been reported to be correlated with stress [8, 35–39]. The findings of Abekura et al. [37] suggest that there is an association between sleep bruxism and psychological stress sensitivity. The case reported by van Selms et al. [39] corroborates the correlation between experienced stress and daytime tooth clenching. The significantly positive association of frequent bruxism with experiencing severe stress has also been proved by Ahlberg et al. [38]. However, the relationship between bruxism and job-related stress seems to be different. Studies of Japanese populations by Nakata et al. [35] concluded that bruxism is weakly associated with job-related stress in men but not in women.

The results of our study support the suggestions that bruxism may be a symptom of ongoing stress in normal work life [38] and is rather strongly associated with the general stress of everyday life. This, in turn, supports the thesis that the prevalence of bruxism depends on the development of civilization and modern lifestyles [22].

In our study, 37% of patients manifested a low state-anxiety level, 36% an average level, and 29% a high level, the differences being statistically insignificant. Similarly, 42% of patients manifested a low trait-anxiety level, 29% an average level, and 29% a high level. Most studies report the association of bruxism with anxiety and depression. As we did not investigate depression, we can relate our results only to anxiety. It is suggested that the association between anxiety and bruxism starts in childhood and persists into adulthood [53]. However, no association between bruxism and psychosocial factors in children younger than 5 years old has been found. A significant association between bruxism and

stressful, anxious, and tense personality traits emerge in children older than 6 years and is present up to adolescence [54]. The results of our study do not support the association between bruxism and anxiety previously reported [4, 42–45, 55, 56].

On the basis of data in the specialist literature, which indicated that women suffer bruxism more often than men [15, 33, 60], intergroup comparisons were conducted which indirectly confirmed this according to the gender of the participants freely recruited into our study. There was no statistically significant difference between women and men in the main variables. There was only a difference in the avoidance of emotional processing. Men declared they used this strategy more often ($M = 4.33$; $SD = 2.03$) than women ($M = 3$; $SD = 2.01$) ($F(1, 51) = 4.67$; $p < 0.05$).

Afterwards, for the further specification of female's and male's bruxism, we correlated the main variables for women and men separately. Nine correlations were possible, and all of them were identified in the female group but only 4 of them in the male group. It shows that women suffering from bruxism manifested more compact view of psychoemotional deficits than men. Next, we calculated the Fisher r-to-z transformation value to assess the significance of the difference between these two correlation coefficients (Table 3). A statistical tendency was only found for the correlation between alexithymia and emotional processing. The correlation in the female group was stronger than in the male group. There are positive correlations between all the variables in the female group, with a very strong correlation between alexithymia and emotional processing that explains ca. 58% of variation. The correlations in the male group are selective; the strongest one being between alexithymia and trait anxiety that explains ca. 56% of variation.

As most previous studies investigated self-reported bruxism, the strength of the present study is the dentist-assessed physical evidence of bruxism, with the additional use of the RDC-TMD questionnaire. The limitations that need to be addressed, however, include the criteria for this assessment. This problem is well known and debatable. Neither occlusal relationships nor the pain are believed to be definitive symptoms of bruxism. According to Lobbezoo and Naeije [16], occlusal interferences have no relevance to bruxism. Ommerborn et al. [14] evaluated 16 occlusal and functional parameters and found no statistically significant differences between sleep bruxers and controls. The assessment of tooth wear additionally failed to be a reliable diagnostic tool due to the high prevalence rate of tooth wear in nonbruxists [55–57]. Manfredini and Lobbezoo [17] and Paesani [6] stated that the use of pain for clinical diagnosis is also unreliable, because the relationship between bruxism and pain is controversial.

We find the age distribution within the clinical sample to be another strength of the study. Most of the participants were younger than 30 years old. This is convergent with the reported age dependence of bruxism occurrence in Hublin et al. [30]. Lavigne and Montplaisir [58] showed the linear decrease of bruxists from 13% among 18–29 years old to 3% among those aged 60 and older. Also, the proportion of females to males within the investigated group reflects the

TABLE 2: Correlation coefficient of investigated variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
(1) Total alexithymia	1													
(2) Difficulty describing feelings	0.86**	1												
(3) Difficulty identifying feelings	0.89*	0.71**	1											
(4) Externally-oriented thinking	0.67**	0.38**	0.39**	1										
(5) Total emotional processing	0.7**	0.65**	0.66**	0.37**	1									
(6) Suppression	0.74**	0.75**	0.61**	0.45**	0.84**	1								
(7) Unprocessed	0.37**	0.37**	0.37**	0.12	0.76**	0.43**	1							
(8) Controllability	0.48**	0.41**	0.49**	0.21	0.83**	-0.6**	0.64**	1						
(9) Avoidance	0.6**	0.51**	0.6**	0.31**	0.84**	0.65**	0.49**	0.62**	1					
(10) Experience	0.69**	0.57**	0.67**	0.41**	0.83**	0.76**	0.031*	0.63**	0.72**	1				
(11) Total perceived stress	0.27***	0.29*	0.35*	0.02	0.46**	0.29*	0.46**	0.48**	0.32*	0.32*	1			
(12) Perceived helplessness	0.45**	0.45**	0.42**	0.19	0.72**	0.52**	0.72**	0.68**	0.5**	0.45**	0.75**	1		
(13) Perceived self-efficacy	-0.43**	-0.42**	-0.33*	-0.33*	-0.6**	-0.51**	-0.57**	-0.5**	-0.48**	-0.41**	-0.06	-0.63**	1	
(14) State anxiety	0.53**	0.38**	0.54**	0.35*	0.6**	0.44**	0.52**	0.54**	0.45**	0.45**	0.45**	0.63**	-0.53**	1
(15) Trait anxiety	0.64**	0.54**	0.65**	0.42**	0.58**	0.49**	0.52**	0.48**	0.41**	0.43**	0.52**	0.68**	-0.54**	0.67**

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.52$ (all two-tailed significance tests).

TABLE 3: Comparison of the correlations between women and men.

Reference	Women ($n = 36$)<	Men ($n = 16$)	Z	p
Alexithymia: emotional processing	$r = 0.76$; $p < 0.001$	$r = 0.52$; $p < 0.05$	1.29	<0.09
Alexithymia: perceived stress	$r = 0.31$; $p < 0.064$	$r = 0.18$; n.s.	—	—
Alexithymia: state anxiety	$r = 0.62$; $p < 0.001$	$r = 0.24$; n.s.	—	—
Alexithymia: trait anxiety	$r = 0.68$; $p < 0.001$	$r = 0.75$; $p < 0.001$	-0.44	Ns.
Emotional processing: perceived stress	$r = 0.44$; $p < 0.01$	$r = 0.55$; $p < 0.05$	-0.45	Ns.
Emotional processing: state anxiety	$r = 0.73$; $p < 0.001$	$r = 0.27$; n.s.	—	—
Emotional processing: trait anxiety	$r = 0.73$; $p < 0.001$	$r = 0.54$; $p < 0.051$	0.94	Ns.
Perceived stress: state anxiety	$r = 0.43$; $p < 0.01$	$r = 0.36$; n.s.	—	—
Perceived stress: trait anxiety	$r = 0.61$; $p < 0.001$	$r = 0.3$; n.s.	—	—

previously published results showing that the prevalence of bruxism is higher among females [12, 30, 56]. However, future research would benefit from more a numerous sample.

Despite a few limitations, we offer the first evidence that bruxism is not associated with emotional processing deficits; however, it is related to stress and alexithymia. Also, state anxiety and trait anxiety are important factors in bruxism.

The significance of psychosocial functioning is believed to be an essential part of the diagnostic process [59]. Because

patients with anxiety and who experience stress seem to have a higher number of risk factors for bruxism [60], the profile of the data obtained suggests the possibility of preventing or minimizing the symptoms of bruxism with a properly constructed psychoprophylactic interaction.

4. Conclusions

Specific psychosocial functioning is a significant factor in explaining the determinants of awake bruxism. Psychosocial

factors such as state anxiety and trait anxiety, stress, and alexithymia are as important as somatic causes in the occurrence and maintenance of bruxism. Our study revealed that most of the bruxers are nonalexithymic patients, but all of them revealed high or average level of stress. Further studies are needed to replicate our finding in larger samples and with more varied psychosocial determinants (e.g., age, generation, education, and employment). Moreover, longitudinal study may also provide valuable insights into the casual mechanisms behind the observed associations.

Data Availability

All data are available on request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Agnieszka Przystańska and Aleksandra Jasielska contributed equally to this work.

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Research Article

Relationship between Burnout and Mental-Illness-Related Stigma among Nonprofessional Occupational Mental Health Staff

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Background. Stigma related to mental illness can be an obstacle affecting the quality of life of people with mental illness. Although mental illness in the workplace is a public problem globally, few studies have investigated the effect of stigma on job-related problems such as burnout. **Aim.** This study aimed to clarify the association between mental-illness-related stigma and burnout among nonprofessional occupational mental health staff. **Methods.** In this cross-sectional study, nonprofessional occupational mental health staff's perceived mental-illness-related stigma was assessed using Link's Devaluation-Discrimination Scale, and their burnout was assessed using the Maslach Burnout Inventory. The association between stigma and burnout was analyzed by multiple linear regression analysis. **Results.** In total, 282 participants completed the questionnaire (response rate: 91.3%). We excluded 54 nurses from the analysis to examine strictly nonprofessional occupational mental health staff. Finally, 228 eligible respondents were surveyed. Multiple linear regression analysis revealed that mental-illness-related stigma was significantly associated with a high degree of depersonalization, which was one of the burnout dimensions. However, the impact of stigma over the depersonalization domain of burnout was minor. **Conclusion.** The results suggest that higher perceived mental-illness-related stigma is associated with more severe burnout. It is important to take measures against mental-illness-related stigma to avoid burnout among occupational mental health staff.

1. Introduction

Stigma is the misrecognition or unfounded recognition of individuals or groups with specific attributes. In the past, such attributes have included skin color, race, sexual preference, infectious disease, and mental illness. Stigma is a serious social problem with negative consequences such as disadvantage, exclusion, and inequality for the targeted person or group. Stigma related to mental illness can be an obstacle affecting the quality of life of people with mental illness. Stigmatizing attitudes toward mental illness have been shown to harm the self-esteem of people suffering from mental illnesses [1], preventing them from seeking mental health services [2] and negatively affecting their employment opportunities [3].

Mental illness in the workplace is a global public problem. Because of the increasing number of employees with mental health issues in Japan, the “Guidelines for Maintaining and Improving Workers’ Mental Health” was published in 2006 [4]. According to this guideline, employers are obligated to appoint occupational mental health staff. Occupational mental health staff members are in charge of practical mental health care in the workplace. Both mental health professionals (e.g., nurses, health nurses, and health supervisors) and nonprofessionals (e.g., labor management staff) may be allocated this position in Japan.

Previous studies have found work associated with mental health to be more stressful than work in other medical fields [5], and mental health professionals are at a high risk for developing burnout syndrome [6]. There are several studies

of burnout focusing on mental health professionals. A study conducted in Wales indicated that one in two mental health nurses are emotionally overextended and exhausted by their work [7]. Mental health social workers in England and Wales showed significant symptomatology and distress associated with burnout twice the level of that reported by a similar survey conducted among psychiatrists [8]. Psychiatrists showed high levels of emotional exhaustion and depersonalization and had higher levels of burnout than other physicians [9]. Therefore, occupational mental health staff may often experience higher stress and burnout than people in other professions.

In Japanese workplaces, labor management staff, who are not mental health professionals, are often allocated occupational mental health staff roles. Due to their lack of knowledge of mental health issues, they are more likely to have a stigmatized view of mental illness. The behavioral impact of such stigma may include avoidance [10] of employees with mental illness. Mental-illness-related stigma can be understood as a possible cause of burnout.

We propose that the health of occupational mental health staff is deeply connected with employees' health. However, no study has evaluated the association between mental-illness-related stigma and burnout for non-professional occupational mental health staff. Therefore, the aim of this study was to clarify the association between this stigma and burnout for nonprofessional occupational mental health staff using self-report questionnaires. We hypothesized that higher perceived mental health stigma would be associated with more severe burnout among nonprofessional occupational mental health staff.

2. Methods

2.1. Subjects. In this cross-sectional study, we distributed self-administered anonymous questionnaires to 309 participants of mental health seminars for occupational mental health staff between 2017 and 2018. These seminars are conducted in accordance with the curriculum published by the Ministry of Health, Labor, and Welfare, and they include mental-health-related matters such as formulating mental health plans, responding to mental illness, providing support for returning to the workplace, and improving the workplace environment. Participants in these seminars voluntarily applied through a public online application. They were occupational mental health staff members, both mental health professionals and nonmental health professionals. Ten seminars were held in the Kansai region of Japan; 282 participants completed the questionnaire (response rate: 91.3%). We excluded 54 mental health professionals from the analysis to examine only non-mental health professionals. This was because we considered their knowledge of mental illness to be different from that of occupational mental health staff, and such differences may affect burnout and stigma.

All participants gave informed consent to participate as volunteers, and they understood that there was no penalty for choosing not to participate. Prior to the seminars, the participants provided the information described below.

2.2. Demographic Data. Demographic data collected in this study included participants' age and gender and the industry they worked in.

2.3. Measurement of Stigma. Stigma toward people with mental illness was measured by Link's Devaluation-Discrimination Scale (DDS) [11]. The reliability and validity of the Japanese version of this questionnaire have been previously established [12, 13]. DDS is a 12-item instrument that asks about the extent of agreement with statements indicating that "most people devalue current or former psychiatric patients by receiving them as failures, as less intelligent than other persons, and as individuals whose opinions need not be taken seriously" [14, 15]. The scale uses a 4-point Likert-type scale ranging from "agree" (4) to "disagree" (1) to measure the stigma. A higher score on the scale indicates a stronger perception of stigma, and reverse scoring was used where necessary. Cronbach's alpha coefficient was 0.80.

2.4. Measurement of Burnout. The Maslach Burnout Inventory (MBI) is the most widely used measure to assess burnout. We used the Japanese version of this scale [16, 17], and its reliability and validity were confirmed [18]. The MBI includes three burnout dimensions: emotional exhaustion (EE; depletion of emotional resources and feelings of fatigue), depersonalization (DP; negative, cynical attitude, and feelings about clients), and personal accomplishment (PA; self-evaluation of one's job effectiveness with regard to working with clients) [8]. The scale contains 17 items and uses a 5-point Likert-type scale ranging from "always yes" (1) to "no" (5) to measure EE (5 items), DP (6 items), and PA (6 items). Higher scores for EE and DP and a lower score for PA indicate a high tendency for burnout [19]. Cronbach's alpha coefficient for each dimension was as follows: 0.80 (EE), 0.82 (DP), and 0.79 (PA).

2.5. Ethics Statement. The Human Subjects Review Committee of Osaka City University approved the protocol of this study (authorization number: 1409). All data were stored only in our database, and the employer did not have access to the data or knowledge of who had participated in the study.

2.6. Statistical Analysis. An independent *t* test was used to examine the differences in age and gender. The distributions of the scores of burnout dimensions and the DDS were not normal. Therefore, a Mann-Whitney *U* test was used to identify the differences between the scores of burnout dimensions and DDS for gender. Similarly, the correlation between stigma and burnout was analyzed using Spearman's correlation. We performed a hierarchical multiple regression analysis to determine whether DDS explained the score of each burnout dimension. Gender and age were entered in step 1, and DDS was entered in step 2. Differences were considered significant at $p < 0.05$. All statistical analyses

were performed using SPSS version 24.0 software (SPSS Inc., Chicago, IL).

3. Results

3.1. Subjects' Characteristics. Table 1 shows the subjects' characteristics and the mean scores for each burnout dimensions and DDS. The mean age of the study population was 46.2 ± 9.9 , with that of male and female participants being 49.2 ± 9.2 and 43.2 ± 9.7 , respectively. The mean age of the male participants was significantly higher than that of the female participants. The sample comprised 109 (47.8%) males and 119 (52.2%) females.

We found no differences in gender in the mean scores on each of the burnout dimensions and DDS, as shown by the Mann-Whitney *U* test. The number of persons involved in the manufacturing industry was the largest (34%); the second biggest industry was services (13%), which was followed by construction (9%).

3.2. Correlations between Stigma and Burnout. Table 2 shows Spearman's correlation between burnout dimensions and stigma according to DDS. There was a weak positive correlation between DP and stigma. All the burnout dimensions correlated with each other.

3.3. Multiple Linear Regression Analysis Examining the Associations between Stigma and Burnout. Table 3 shows the results of the hierarchical multiple linear regression analysis of the scores for each of the burnout dimensions and the scores for DDS. In step 1 of the analysis for EE, the results showed no significant predictor. In step 2, DDS accounted for no change in variance ($F=3.80$, ns). In step 1 of the analysis for DP, there was no significant predictor. In step 2, DDS accounted for a significant additional 2.2% of the variance ($F=2.96$, $p < 0.05$) (i.e., stigma predicted a higher level of DP). In step 1 of the analysis for PA, age was a significant predictor. In step 2, DDS accounted for no change in variance ($F=1.82$, ns).

4. Discussion

In this study, we evaluated the association between mental-illness-related stigma and burnout using DDS and MBI measures. The participants were nonprofessional occupational mental health staff in a workplace. This study found that mental-illness-related stigma was significantly associated with DP. However, the impact of stigma over DP was minor. EE and PA were not associated with stigma.

To our knowledge, no prior studies have evaluated the association between mental-illness-related stigma and burnout dimensions among mental health nonprofessionals. Thus, the present results are discussed in the context of previous results obtained for mental health professionals. The burnout dimensions found to be correlated with mental-illness-related stigma have differed across various studies. One previous study conducted among mental health professionals found that a lower level of PA was associated with

avoidant attitudes toward patients [20]. Another study found that all three burnout dimensions were correlated with mental health professionals' negative feelings toward patients [21]. The current study, meanwhile, revealed that mental-illness-related stigma had a significant effect only on DP but not on other burnout dimensions.

We consider several reasons for the differences in these results. First, our participants were nonprofessional occupational mental health staff (e.g., labor management staff), whereas in the previous studies, the participants were mental health professionals. As the number of employees suffering from mental illnesses in Japan is increasing, the demand for occupational mental health staff is increasing. However, in practice, in Japan, small-scale companies with less than 50 workers are often not able to secure a mental health professional, and nonprofessional staff are often appointed to occupational mental health roles [22]. Since they have little knowledge of mental health issues and are not familiar with appropriate responses to employee mental illness, this lack of expertise might affect which burnout dimensions are associated with stigma.

Second, stigma is a multidimensional phenomenon that can be subcategorized into self-stigma, public stigma, and stigmatizing experiences [23], and there are various measures to assess mental-illness-related stigma [24]. The differences between the scales measuring stigma might lead to different results. We used DDS to assess stigma because its validity and reliability are well established. In the future, we can get more comprehensive results by using various measures of stigma and comparing them.

Previous studies that examined the effects of mental-illness-related stigma used the social distance scale to measure the attitudes and behavior of individuals suffering from mental illness [25]. Mental-illness-related stigma may create a tendency to increase social distance from someone with mental illness. In our study, we found an association between mental illness stigma and DP. DP refers to negative, cynical, or excessively detached responses to various aspects of a job [26]. Increasing the preference for social distance might appear as DP. At the same time, in the present study, stigma was found not to be correlated with EE and PA. This could be because the preference for social distance might lead to the avoidance of communication with someone suffering from mental illness. Because of the absence of emotional communication, stigma might not affect EE. Additionally, our participants were nonprofessionals, and they had little knowledge of mental illness, so it was understandable that they did not feel PA regardless of the presence or absence of stigma.

In the present study, mental-illness-related stigma was associated with burnout. As such, the results suggest a need for antistigma or antiburnout interventions to support employees' mental health in Japanese workplaces. Such interventions for stigma and burnout could work complementarily. Reducing mental-illness-related stigma is a global issue, and many interventions attempting to reduce it have been conducted. The World Psychiatric Association's Global Antistigma Program was initiated in 2001 in six German cities. After three years, a representative of the association

TABLE 1: Participant demographic variables, Maslach Burnout Inventory scores, and Devaluation-Discrimination score.

	Range	Total	Mean ± SD	Male	Female
Number		228		109	119
Age		46.2 ± 9.9		49.2 ± 9.2	43.2 ± 9.7
Maslach Burnout Inventory scores					
Emotional exhaustion	(5–25)	12.4 ± 4.3		12.0 ± 4.3	12.7 ± 4.2
Depersonalization	(6–30)	11.8 ± 4.1		12.1 ± 4.2	11.5 ± 4.1
Personal accomplishment	(6–30)	20.2 ± 4.3		20.4 ± 4.0	20.1 ± 4.5
Devaluation-Discrimination score	(12–48)	30.9 ± 4.7		30.7 ± 4.5	30.9 ± 4.9

TABLE 2: Correlation between burnout and stigma.

	1	2	3	4
(1) Emotional exhaustion	—			
(2) Depersonalization	0.613**	—		
(3) Personal accomplishment	0.266**	0.273**	—	
(4) Devaluation-Discrimination	-0.003	0.131*	0.058	—

* $p < 0.05$; ** $p < 0.01$.

TABLE 3: Hierarchical multiple linear regression analysis and the Devaluation-Discrimination scores on the Maslach Burnout Inventory.

	Emotional exhaustion		Depersonalization		Personal accomplishment	
	Step 1 β	Step 2 β	Step 1 β	Step 2 β	Step 1 β	Step 2 β
Gender	-0.03	-0.03	-0.13	-0.14	-0.08	-0.08
Age	-0.23	-0.24	-0.10	-0.10	-0.16*	-0.16*
Devaluation-Discrimination		0.01		0.15*		0.01
R	0.23	0.23	0.14	0.20	0.16	0.16
R ²	0.05	0.05	0.02	0.04	0.03	0.03
R ² change score	0.05	0.00	0.02	0.02	0.03	0.00
F	5.72**	3.80	2.07	2.96*	2.73	1.82

* $p < 0.05$; ** $p < 0.01$. Step 1: adjusted for gender and age; step 2: adjusted for Devaluation-Discrimination score.

conducted a telephone survey in these cities ($N = 4622$) that confirmed the efficacy of the antistigma intervention [27]. The results of a previous systematic review indicated that social contact is the most effective type of intervention for improving stigma-related knowledge and attitudes in the short term (<4 weeks) [28]. In Japan, systematic reviews regarding antistigma interventions among university and college students indicated that social contact and video-based social contact may improve attitudes toward mental illness and reduce social distancing from people with mental illnesses [29]. It is suggested that in the workplace, mental health education focusing on social contact for occupational mental health staff may be useful for reducing stigma.

Furthermore, we should recognize the need to intervene in burnout among occupational mental health staff. Previous studies have examined the effectiveness of a number of burnout intervention programs in workplaces. Cognitive behavioral training and counseling as well as adaptive coping with refresher courses have been shown to decrease burnout [30, 31]. We should focus on both the risk of burnout and mental-illness-related stigma, which make the work of occupational mental health staff difficult to address.

The effect size of the association between DP and stigma was small. Previous studies have examined the correlation between burnout and stigma among mental health professionals. For example, a sample of mental health professionals showed a weak correlation between lower levels of PA and stigmatizing attitudes [20]. In another study, a moderate correlation was found between burnout and negative feelings toward patients among psychiatric staff [21]. A possible explanation for these moderate or weak correlations between burnout and stigma is that other variables might affect or mediate the outcomes. Therefore, future research should account for other variables such as mental health problems, self-esteem, and personal contact with people with mental health problems.

This study had several limitations. First, the small sample size might limit the generalizability of the findings. Second, we used self-reported questionnaires; therefore, the results may be influenced by personal differences or response tendencies. Third, this was a cross-sectional study; thus, it cannot be inferred with certainty from our data that the relationship between stigma and burnout is causal. Fourth, differences in work-related status (e.g., occupation, stage of career, industry, salary, hours worked, and company size)

could potentially bias the results. The size of the company participants worked for ranged from several people to twenty thousand people. The industry types and the positions held also differed. These potential biases might have influenced the interpretation of the results. Further study is needed to compare the results for mental health professionals and nonprofessionals working for relatively large companies with those working for relatively small companies. Finally, our data were collected from participants in mental health seminars. Therefore, we must consider a potential selection bias. To avoid this bias, a study based on random sampling should be conducted in the future. Future cohort or longitudinal research addressing the relationship between stigma and burnout in the workplace might also be beneficial.

5. Conclusion

This is the first study showing that mental-illness-related stigma is significantly associated with the burnout dimension of depersonalization among nonprofessional occupational mental health staff in Japan. The results suggest the importance of efforts to reduce mental-illness-related stigma in the workplace. To avoid burnout among occupational mental health staff, it is important to take measures against mental-illness-related stigma.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors have no conflicts of interest to declare.

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Research Article

Psychophysiological Characteristics of Burnout Syndrome: Resting-State EEG Analysis

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Introduction. The consequences of chronic work-related stress are related to various emotional, cognitive, and behavioral symptoms. Occupational burnout as a complex syndrome is characterized by exhaustion, cynicism, and lower professional efficacy. Moreover, the growing amount of research on the neural correlates of burnout broadens the existing knowledge on the mechanisms underlying this syndrome. **Aim of the Study.** The aim of the study is to explore possible differences in brain activity between burnout and nonburnout employees. Frequency-specific EEG power analyses in a resting-state condition in burnout subjects and controls are presented. **Materials and Methods.** Burnout employees ($N=46$; 19 men) were matched with the control group ($N=49$; 19 men; mean age: 36.14 years, $SD=7.89$). The Maslach Burnout Inventory-General Survey (MBI-GS) and the Areas of Worklife Survey (AWS) scale were used to measure burnout symptoms and work conditions, respectively. A 256-channel EEG (EGI System 300) was used to collect psychophysiological data. A repeated measures ANOVA was performed with condition (eyes-open vs. eyes-closed) and region (6 levels: extracted scalp regions) factors; burnout (2 levels: burnout vs. no burnout) was the grouping factor. **Results.** A significant difference was observed only in the alpha frequency band: the burnout group revealed significantly lower alpha power in the eyes-open condition compared to the controls ($p<0.05$). The correlation analysis revealed that gender may significantly change the pattern of relations between EEG spectral characteristics and burnout symptoms. **Conclusions.** Reduced alpha power in burnout individuals suggests cortical hyperactivity and may be related to greater mental effort and the possible development of compensatory mechanisms by burnout subjects.

1. Introduction

Burnout syndrome is defined as a process of psychological reaction to long-term work-related stress [1] which is influenced by individual and contextual factors [2]. According to the latest 11th International Classification of Diseases (ICD-11), burnout is included among “Factors influencing health status or contact with health services” in the section “Problems associated with employment or unemployment” (code: QD85) and refers to workplace stress that has not been effectively managed [3]. In ICD-11, burnout is conceptualized as an occupational phenomenon that is specifically related to experiences in the professional context and is not classified as a medical condition. World Health Organization characterizes burnout by three dimensions: “(1) feelings of energy depletion or exhaustion; (2) increased mental distance

from one’s job, or feelings of negativism or cynicism related to one’s job; and (3) reduced professional efficacy” [3]. It directly corresponds to Maslach, Jackson, & Leiter [4] who described burnout as a state of exhaustion, depersonalization or cynicism, and low professional efficacy. Some researchers emphasize however that the main components of burnout syndrome are psychophysical exhaustion and psychological distancing from work [5].

Burnout research has significantly developed in recent years and expanded over various research areas. The first studies on burnout were related to work and organizational psychology [1, 6–8], but further research on burnout syndrome is also relevant to clinical psychology [9–14], neuropsychology [15, 16], neurophysiology [17–19], and neuroscience [20–27]. It seems that burnout syndrome has become a popular research area for three reasons: (1) its prevalence

in the general population of employees; (2) significant individual and organizational consequences; and (3) important scientific dispute on its etiology and the symptomatic characteristics that differentiate it from other diseases, especially from depression [9, 28]. Regarding methodology in burnout studies, objective methods and research outcomes are particularly needed to answer the question of whether severe burnout syndrome may be a separate entity, or whether it is a form of depression or anxiety-depression disorder induced by long-term work-related stress.

Neuroimaging research revealed that burnout or prolonged occupational stress correlated with specific anatomical and functional brain characteristics [22, 23, 25, 26]. For example, Jovanovic et al. [23] showed that subjects with chronic work-related stress revealed functional disconnection between the amygdala and the medial prefrontal cortex (mPFC), including anterior cingulate cortex (ACC). Moreover, they observed that receptors which are involved in the HPA regulation (5-HT1A receptors) were reduced in the ACC, the insular cortex, and in the hippocampus. These results indicate significant structural and functional brain changes and may suggest impaired top-down regulation of stress in subjects with prolonged work-related stress [23]. Similarly, Blix, Perski, Berglund, & Savic [26] analyzing the sample with chronic occupational stress observed reduction in the grey matter volumes of the ACC and the dorsolateral prefrontal cortex (dPFC), and reduced volumes of caudate and putamen. Savic [25] observed that burnout patients demonstrated significantly thinner mesial frontal cortex and selective changes in subcortical volumes: their amygdala volumes were bilaterally increased and caudate volumes were decreased. Golkar et al. [22] observed weaker activation of the functional network between the right amygdala and the anterior cingulate cortex in burnout subjects what may explain difficulties in controlling and coping with negative emotions. These studies give a solid basis for further exploration of neural correlates of burnout and search for its neurophysiological indicators.

In previous psychophysiological studies using electroencephalography (EEG), cognitive impairments in burnout subjects, accompanied by a changed pattern of selected Event-Related Potentials (ERP), were observed [29–33]. In our earlier study, we observed altered ERP pattern of processing of emotion-related stimuli in burnout subjects, which may explain one of the core burnout components: depersonalization/cynicism [15]. Additionally, Luijtelaar and colleagues [29] analyzed frequency-specific EEG power and revealed that lower alpha peak frequency and reduced beta power were observed in burnout subjects. Frequency-specific EEG power analyses may be an interesting perspective in exploring burnout and may bring additional insights in the characteristics of burnout syndrome. These explorations in relation to burnout may be particularly interesting in terms of such burnout characteristics as mental fatigue, depletion of energy, and a state of exhaustion [1, 7, 34–38]. Some studies clearly showed that burnout subjects demonstrate specific arousal patterns such as lower energy levels and higher levels of tension [39, 40]. In this context, the indexes of arousal levels and reactivity may be of particular interest.

According to Fonseca, Tedrus, Bianchini, & Silva [41], in resting conditions, the differences in alpha EEG activity between eyes-closed and eyes-open conditions could be used as a measure of resting-state arousal. Arousal level may refer to a reduction in absolute power in the eyes-open condition (EO) as compared to the eyes-closed condition (EC). Another index of arousal, the level of reactivity that may be assessed by alpha reactivity index, counted as a quotient of absolute alpha power in EO to absolute alpha power in EC (the greater alpha reactivity index relates to lower reactivity) [41].

Regarding the overlapping effects with depression [10, 28–30, 42], it is particularly interesting to analyze frontal alpha asymmetry (FAA) in burnout. In depression, frontal alpha (8–13 Hz) asymmetry with hypoactivity in the frontal lobe has been reported in many findings [43–45], so FAA may also be observed in burnout groups. However, some studies indicate that the greater right alpha activity in depression relates to small to medium effect sizes [46] and that this tendency is not evident [47]. One of the latest meta-analysis on FAA in depression [48] confirms these ambiguities, indicating the limited diagnostic value of FAA in major depressive disorders. Moreover, a previous study on EEG spectral analysis in a burnout group did not reveal FAA [29]. In the light of these findings, it is difficult to conclude whether the alpha asymmetry is typical of burnout subjects.

In this study, we aim to analyze the spectral characteristics of resting-state EEG and compare them between burnout subjects and controls. Referring to a previous study on spectral power analysis in burnout [29], we expect to find significant differences between burnout subjects and controls in α (8.5–13.0 Hz) and β (13.5–30 Hz) frequency. In comparison to the control group, our hypotheses are as follows: (H1) significantly lower alpha peak frequency will be observed in the burnout group; (H2) significantly lower beta power will be observed in the burnout group; (H3) the burnout group will not be differentiated by frontal alpha asymmetry. Referring to van Luijtelaar et al.'s study [29], we will compare resting EEG in the eyes-open and eyes-closed conditions. Furthermore, with reference to Tement et al.'s [49] study, we expect to observe differences in alpha power in resting EEG; however, no specific hypotheses were formulated due to the differences in the study sample and methodology (students; only eyes-closed condition; regression models).

2. Materials and Methods

2.1. Participants. Subjects were recruited from 272 volunteers who responded to an invitation describing the project's aim and a short description of the study. The invitation was presented on business social networks and sent in emails to public and private organizations. The inclusion criteria for the study were as follows: employee status (active workers with higher education and at least 1.5 years of work experience, working in a day-shift system), right-handedness, correct or corrected-to-normal vision, addiction free, no history of neurological or psychiatric diseases, and not pregnant. The initial sample consisted of 100 participants (40 men). Due to poor spectral EEG data quality and ambiguous burnout characteristics, 5 participants were excluded. The

study sample ($N=95$) consisted of the burnout group ($N=46$; 19 men), which was matched with the control group ($N=49$; 19 men) in terms of gender and age characteristics (mean age: 36.14 years, $SD=7.89$).

The study protocol was approved by the Bioethics Commission of Jagiellonian University and was carried out in accordance with the recommendations of the APA Ethics Code. Participants were paid for their contribution in the project. Each subject gave written informed consent.

The burnout group consisted of participants who had high scores on burnout measure and who reported their job-related context as stressful. Burnout and job context were assessed using Polish versions of the Maslach Burnout Inventory-General Survey (MBI-GS) [3] and the Areas of Worklife Survey scale (AWS) [50].

The MBI-GS consists of 16 items rated on a 7-point scale ranging from 0 “never” to 6 “every day.” The instrument measures three dimensions of burnout: exhaustion (5 items), cynicism (5 items), and professional efficacy (6 items). Cronbach’s α coefficients based on the sample are $\alpha_{\text{exhaustion}} = 0.922$, $\alpha_{\text{cynicism}} = 0.9101$, and $\alpha_{\text{efficacy}} = 0.889$.

The AWS consists of 29 items which relate to work conditions and assess employees’ perceived alignment between their work environment and individual preferences. Six areas of worklife are analyzed: workload (6 items), control (3 items), reward (4 items), community (5 items), fairness (6 items), and values (5 items). They are rated on a 5-point scale ranging from 1 “strongly disagree” to 5 “strongly agree.” Cronbach’s α coefficients were $\alpha_{\text{workload}} = 0.848$, $\alpha_{\text{control}} = 0.803$, $\alpha_{\text{reward}} = 0.839$, $\alpha_{\text{community}} = 0.894$, $\alpha_{\text{fairness}} = 0.864$, and $\alpha_{\text{values}} = 0.757$.

The burnout group comprises participants who scored high (>3) on the two burnout dimensions of exhaustion and cynicism, and low scores (< 3) in at least three AWS scales; this indicated higher burnout symptoms and more stressful work-related context, as assessed by a lower degree of matching between the individual’s workplace and preferences.

2.2. Experimental Procedure. The EEG data was recorded for 3 minutes for the eyes-open and 3 minutes for the eyes-closed condition. Subjects were asked to sit still and focus on the fixation point; when their eyes were closed, they were asked to sit still with closed eyes.

2.3. EEG Analysis. Continuous dense-array EEG data (HydroCel Geodesic Sensor Net, EGI System 300; Electrical Geodesic Inc., OR, USA) was collected from a 256-channel EEG at a sampling rate of 250 Hz (band-pass filtered at 0.01–100 Hz with a vertex electrode as a reference) and recorded with NetStation Software (Version 4.5.1, Electrical Geodesic Inc., OR, USA). The impedance for all electrodes was kept below 50 k Ω . The offline data analysis was conducted with the open-source EEGLAB toolbox [51]. Before the preprocessing steps, facial electrodes were removed; thus, further analysis was performed on 224 channels. Data was digitally filtered to remove frequencies below 0.5 Hz and above 35 Hz. Average reference was recomputed, and bad channels were automatically removed

by kurtosis measures with a threshold value of 5 standard deviations. Next, continuous data was visually inspected in order to manually remove channels or time epochs containing high-amplitude, high-frequency muscle noise, and other irregular artifacts.

Independent component analysis was used to remove artifacts from data. Due to the large number of channels, decomposition of EEG data with the Infomax algorithm was preceded with Principle Component Analysis. Fifty independent components were extracted and visually inspected for each subject. On the basis of the spatiotemporal pattern [52, 53], components recognized as blinks, heart rate, saccades, muscle artifacts, or bad channels were removed. Missing channels were interpolated, and ICA weights were recomputed. Data was divided into the eyes-open (EO) and eyes-closed (EC) conditions. Spectral decomposition was performed using the Welch window, followed by Fast Fourier Transform (FFT). Mean power spectra for alpha (8–13 Hz), beta (14–35 Hz), delta (1–3 Hz), and theta (4–7 Hz.) were extracted for every participant from the electrode clusters localized at the left and right anterior, left and right central, and left and right scalp sites.

3. Results and Discussion

The statistical analyses were performed for each frequency band separately. There was no significant effect between the groups for the beta, delta, and theta bands; thus, the statistical analyses will be presented only for the alpha frequency band.

The repeated measures ANOVA was performed with condition (EO vs. EC) and region (6 levels: extracted scalp regions) factors; burnout (2 levels: burnout vs. no burnout) was the grouping factor. As expected, there was a main effect of condition ($F_{(1,93)}=341.82$, $p < .001$, $\eta_p^2 = 0.786$), and alpha power was significantly higher for closed eyes. Moreover, an interaction effect of group and condition was observed ($F_{(1,93)}=5.43$, $p < .05$, $\eta_p^2 = 0.055$). The post hoc analysis revealed that there was a significant difference in the OE condition ($p < .05$), with a lower alpha power for the burnout vs. no burnout group (see Figure 1). Finally, there was a significant main effect of scalp region ($F_{(5,465)}=82.04$, $p < .001$, $\eta_p^2 = 0.469$) and an interaction effect of condition and scalp region ($F_{(5,465)}=52.51$, $p < .001$, $\eta_p^2 = 0.361$). However, these effects were not modulated by burnout occurrence; thus, we neither explored nor interpreted these effects. No significant differences were observed in alpha individual peak frequency between the studied groups.

Thus, we observed significantly lower alpha power in the burnout group in the eyes-open condition. Our results do not support hypothesis 1, which relates to lower alpha peak frequency, or hypothesis 2, which relates to lower beta power in burnout subjects. No significant group or interaction effect was observed. Our results support hypothesis 3, i.e., frontal alpha asymmetry is not observed in burnout subjects. This is in line with Luijtelaar et al.’s [29] observations.

Although to the best of the authors’ knowledge higher alpha power has not been observed in any burnout group,

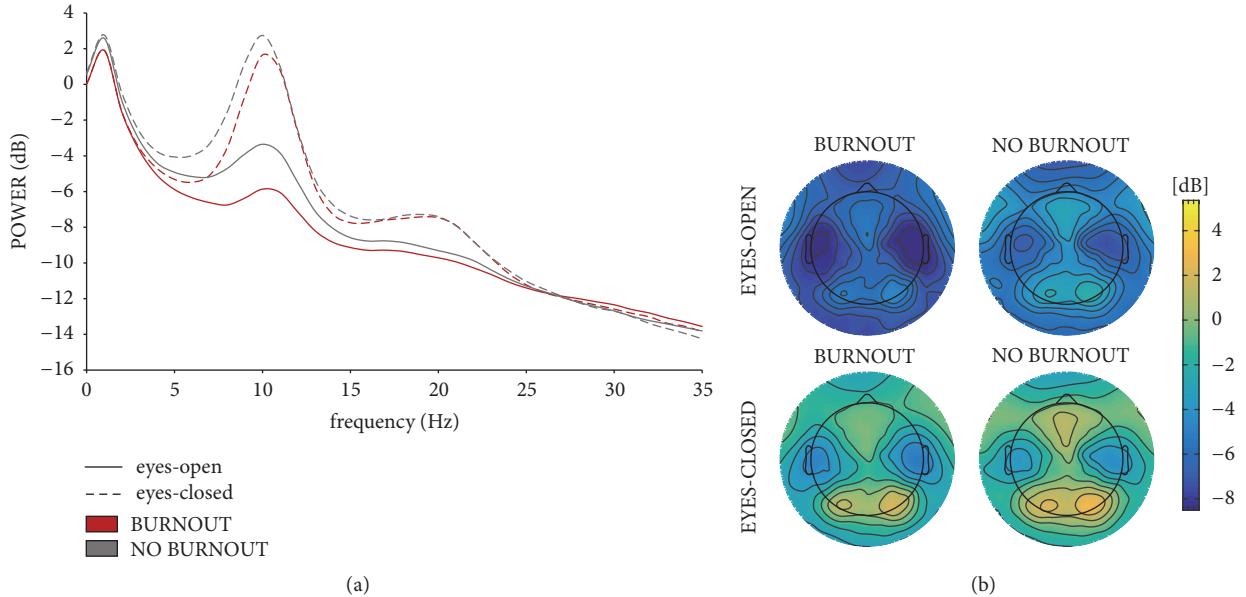


FIGURE 1: (a) Power spectra in the eyes-open and eyes-closed conditions for the burnout and no burnout groups. (b) Alpha power topography in the eyes-open and eyes-closed condition for the burnout and no burnout groups.

this tendency could be expected as burnout reveals some symptomatological similarities to fatigue and depression, for which elevated alpha power has been reported [29, 49]. Thus, the presented results show a novel characteristic in burnout subjects, indicating cortical hyperactivity rather than hypoactivity, which is typical of depression and fatigue.

In further correlation analysis, in the eyes-open (Table 1) and eyes-closed (Table 2) conditions, we observed a significant relation between alpha power and two burnout symptoms: exhaustion and cynicism. For exhaustion, a significant negative correlation was revealed in the eyes-open condition for the anterior, central, and posterior areas. This was observed as global effect for each region and for all left and right areas. In the eyes-closed condition, a significant correlation was observed only for the anterior (globally and hemispheric), central left, and posterior global and left areas. In the eyes-closed condition, the correlation coefficients were weaker compared to the eyes-open condition. For cynicism, significant negative correlations were observed in the eyes-open condition for the global anterior and posterior areas and for both the left and right sides. Weaker correlations were observed for the central global and central left regions.

Further alpha power analysis took gender into account as an important characteristic which may reverse the pattern of relations between alpha power and burnout symptoms [49]. In line with Tement et al's findings [49], we observed that alpha power significantly correlated with burnout only in the male subjects ($N=38$). In females ($N=57$), although the tendency for negative correlation remains, the relations between alpha power and burnout symptoms in most areas failed to reach significance. The only significant negative correlation between exhaustion and alpha power was observed in the anterior right in the eyes-open condition ($r= 0.32$, $p=0.049$). In male subjects, a significant negative correlation

was observed between alpha power and cynicism for all areas in the eyes-open condition. These relations were observed for global analyses for the anterior ($r= -0.37$, $p=0.021$), central ($r= -0.37$, $p=0.023$), and posterior ($r= -0.35$, $p=0.032$) areas, as well for hemispheric analyses (anterior left: $r= -0.41$, $p=0.011$; right: $r= -0.34$, $p=0.036$; central left: $r= -0.37$, $p=0.021$; right: $r= -0.35$, $p=0.029$; posterior left: $r= -0.35$, $p=0.033$; right: $r= -0.35$, $p=0.033$). Interestingly, for male subjects, additional significant correlations were found between alpha power and efficacy; all these correlations were positive and were noticed only in the eyes-open condition (anterior left: $r= 0.33$, $p=0.042$; central global: $r= 0.39$, $p=0.016$, left: $r= 0.42$, $p=0.009$, and right: $r= 0.36$, $p=0.028$; posterior global: $r= 0.32$, $p=0.048$, and left: $r= 0.34$, $p=0.035$). These analyses reveal that gender may significantly change the pattern of relations between spectral EEG characteristics and burnout symptoms, thus supporting the findings and conclusions of Tement et al. [49].

Further analysis is based on the index of alpha power in the eyes-open condition, referenced to the eyes-closed resting condition, which is defined as the task-related power decrease/increase (TRPD/TRPI). This index is calculated as $TRPD/TRPI\% = (EO-EC)/EC \times 100$ [54–56] and is described as a valuable measure of cortical reactivity. A task-related power decrease (TRPD) of EEG alpha rhythms at about 8–12 Hz reflects cortical activation, while a task-related power increase reflects cortical deactivation [54]. Our analyses on the TRPD index revealed significant differences between the study groups in the central right ($F_{(1,93)}=6.78$, $p<.05$, $\eta_p^2=0.068$) and the posterior area ($F_{(1,93)}=5.86$, $p<.05$, $\eta_p^2 = 0.059$), indicating a higher TRPD index in burnout subjects. We also noticed a significant positive correlation between TRPD in the central right region and cynicism ($r= 0.27$, $p=0.009$). This may suggest that burnout correlates with the

TABLE 1: Correlation coefficients between alpha power and burnout symptoms in the eyes-open condition (N=95).

Condition	Region	Site	MBI-GS: Exhaustion	MBI-GS: Cynicism	MBI-GS: Efficacy
Eyes-open	Anterior	Global	-0.2952 p=0.004	-0.2761 p=0.007	0.1425 p=0.168
			L -0.2872 p=0.005	-0.2831 p=0.005	0.1380 p=0.182
			R -0.2897 p=0.004	-0.2586 p=0.011	0.1424 p=0.169
		Global	-0.2598 p=0.011	-0.2084 p=0.043	0.1229 p=0.235
	Central	Global	L -0.2754 p=0.007	-0.2265 p=0.027	0.1384 p=0.181
			R -0.2374 p=0.021	-0.1833 p=0.075	0.1058 p=0.308
			-0.3050 p=0.003	-0.2722 p=0.008	0.1576 p=0.127
		Global	L -0.3186 p=0.002	-0.2818 p=0.006	0.1768 p=0.087
	Posterior	Global	R -0.2899 p=0.004	-0.2583 p=0.011	0.1402 p=0.175
			-0.3050 p=0.003	-0.2722 p=0.008	0.1576 p=0.127
			L -0.3186 p=0.002	-0.2818 p=0.006	0.1768 p=0.087
		Global	R -0.2899 p=0.004	-0.2583 p=0.011	0.1402 p=0.175

TABLE 2: Correlation coefficients between alpha power and burnout symptoms in the eyes-closed condition (N=95).

Condition	Region	Site	MBI-GS: Exhaustion	MBI-GS: Cynicism	MBI-GS: Efficacy
Eyes-closed	Anterior	Global	-0.2130 p=0.038	-0.1282 p=0.216	0.1248 p=0.228
			L -0.2176 p=0.034	-0.1444 p=0.163	0.1316 p=0.204
			R -0.2044 p=0.047	-0.1214 p=0.241	0.1189 p=0.251
		Global	-0.1933 p=0.061	-0.0931 p=0.370	0.0920 p=0.375
	Central	Global	L -0.2184 p=0.033	-0.1212 p=0.242	0.1186 p=0.252
			R -0.1627 p=0.115	-0.0620 p=0.551	0.0643 p=0.536
			-0.2139 p=0.037	-0.1336 p=0.197	0.1258 p=0.224
		Global	L -0.2250 p=0.028	-0.1390 p=0.179	0.1324 p=0.201
	Posterior	Global	R -0.1967 p=0.056	-0.1151 p=0.267	0.1149 p=0.267
			-0.2139 p=0.037	-0.1336 p=0.197	0.1258 p=0.224
			L -0.2250 p=0.028	-0.1390 p=0.179	0.1324 p=0.201
		Global	R -0.1967 p=0.056	-0.1151 p=0.267	0.1149 p=0.267

TRPD index, showing that greater cynicism is related to a higher TRPD index, which reflects lower cortical activation in the right central brain areas. Furthermore, we found a weaker but significant positive correlation between the TRPD index in the left anterior area and efficacy ($r= 0.24, p=0.017$), which may suggest that greater efficacy is related to lower cortical activity in the anterior left-brain area (indexed by higher TRPD).

Most of the studies of structural and functional brain changes in burnout included subjects who had severe and long-lasting symptoms and sometimes required at least 50% sick leave for stress-related symptoms for a minimum of 6 months before the study [23]. In the presented study, although it was conducted on a nonclinical burnout sample, the results confirm different brain characteristics in burnout subjects. We observed significantly lower alpha power in

the burnout group in the eyes-open condition, which was not reported by previous EEG studies on burnout [29, 49]. This might be associated with the sample characteristics because Luijtelaar et al. [29] tested subjects with more severe burnout symptoms that led to a reduction of their work time of up to 50% for at least 3 months. It seems that the consequences of work-related stress and/or other health problems in their study sample were greater than in our sample of healthy and currently employed full-time workers. Therefore, it seems that burnout severity may be manifested by differences in the EEG power spectrum; however, further comparative analysis conducted among individuals with different burnout levels is required to draw clear conclusions. Referring to Tement et al.'s [49] study, their sample comprised students aged between 19 and 29 with no distinctive burnout outcomes, and their analysis was based on the eyes-closed condition only. Thus, the sample characteristics in all previously presented findings differ significantly, which may result in different study outcomes and lead to inconclusive findings.

4. Conclusions

The EEG power spectrum, regulated by anatomically complex homeostatic systems in the various frequency bands, is generally stable in healthy individuals but can be abnormal in some psychiatric disorders due to the dysfunction of this regulation [57]. The presented power analysis showed that in the eyes-open condition the alpha power was lower in the burnout group than in the controls, suggesting that power density might even be sensitive to differences between the healthy and the nonclinical burnout samples.

From the perspective of functional meaning, the reduced alpha power in burnout individuals suggests cortical hyperactivity and may be related to the greater mental effort and possible compensatory mechanisms developed by burnout subjects, as we pointed out in our previous findings [30]. The decreased alpha power is a novel characteristic of burnout syndrome and may indicate different mechanisms compared to depression and fatigue. However, further studies are required to verify these findings in other nonclinical and clinical burnout samples.

Finally, our findings indicate that gender may change the pattern of relations between spectral EEG characteristics and burnout symptoms; therefore, in future studies on burnout, gender should be considered as an important moderating factor.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Research Article

Sometimes It Drains, Sometimes It Sustains: The Dual Role of the Relationship with Students for University Professors

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University organizational contexts have been changing significantly in recent years, and academic staff are expected to manage larger workloads at an increased pace. This can threaten their well-being and exacerbate work-related stress—possibly creating negative impacts on their mental and physical states. Surprisingly, academic occupational psychological health is still rarely studied. By referring to the Job Demands-Resources (JD-R) conceptual model, this study aimed to analyze the relationship between university teachers' well-being and job demands and resources, with a particular focus on the role of the relationship with students. Specifically, 550 associate and full professors were studied to determine the impact of job characteristics, quality of relationships in the work environment, and negative and positive relations with students regarding emotional exhaustion and work engagement. Hierarchical multiple regression models allowed us to highlight the fact that emotional exhaustion was positively and significantly associated with workload, conflicts with colleagues, and requests from students, and it was negatively associated with work meaning. Work engagement was positively and significantly associated with work meaning and social support from students. Our study points out that the flexible and renowned JD-R model can successfully be used to analyze the occupational psychological health of academics. Further, our study underscores the fact that, among job demands and resources, the often-neglected relations with external users (the students) can play an important role in university teachers' perceptions of exhaustion and engagement.

1. Introduction

Universities in European countries have been experiencing a complex situation in recent years. Research funding has been greatly reduced, but high formative offerings are still expected in a market-oriented approach [1–3]. Within this framework, and considering other possible sources of stress, such as unsatisfying systems of recognition or reward and work-family conflict [4], academics' occupational well-being can be severely threatened. Nevertheless, university professors' well-being can be an important factor in offering quality (formative) services. Several studies [5] show that quality of work is positively related to professionals' levels of well-being.

To analyze university teachers' psychological health, in line with [6], the renowned Job Demands-Resources (JD-R) model [7] can be used. This conceptual model assumes that employees' psychological health can be affected by two

main factors: job demands and job resources. Job demands are all aspects of the job that require the worker to exert physical and/or psychological effort, while job resources are those aspects of the job that help achieve work goals and reduce job demands. If job demands are associated with physiological and/or psychological costs, job resources can relieve these costs, thus creating positive occupational well-being outcomes, such as work engagement. Therefore, a dual process induced by both requests and resources takes place. As a result of the first process (impairment), workers can experience progressive exhaustion due to excessive demands. In the second process (motivational), employees can improve their ability to cope with demands if resources are available. As a result, they can increase motivation, satisfaction, and work engagement. Many studies [8] within the conceptual JD-R model framework consider requests and resources referring to the work content relationship quality inside the

organization. Among job requests, one of the most relevant is the workload based on the quantity of tasks requiring completion and the pressure to finish them [7]. Conversely, based on performance feedback or activity meaning or significance (frequently) [9], the work itself can offer sustenance that can enhance motivation. Other important sources of requests and resources at work are at the interpersonal level. Conflicts in work relationships can indeed be emotionally demanding for workers [10]. However, positive and supportive relationships with supervisors and coworkers are among the most cited [6, 10–14] resources that can sustain the motivation process, thus reducing burnout risk and enhancing work engagement.

One of the main strengths of the JD-R model is its ductility, as it can include both general and specific demands and resources for all kinds of professions and organizational contexts. Previous studies [6] demonstrated that particular sources of stress for academics are the workload in terms of bureaucratic requirement deadlines, an increasing number of students to look after, and conflicting relationships with colleagues (see, among the others, [3, 15]). However, the intrinsic reward or source of meaning, namely, the pedagogical impact of teaching, can be a resource for academics [16]. Notwithstanding, for professions in which the relationship with users represents a central dimension (e.g., education sector, nursing profession, and public services), with few exceptions [16], demands and resources from users have rarely been considered [17]. More precisely, several authors underline the demanding role that can be played by disproportionate requests [18–20], mistreatment [21], or aggressive behaviors [22, 23] from users or by prolonged monodirectional supply of caring [17, 24]. The negative side of relationships with users or clients is largely described as a source of requests that can drain professionals' psychological resources and lead to emotional exhaustion. To counterbalance this relational depletion, a large part of the extant literature considers the buffering role played by social support in containing stress and burnout [25, 26]. Traditionally, the most cited sources of social support at work are, as previously described, within the organization, colleagues, supervisors, and/or the organization itself [6, 11–13]. Although less considered as a source of support, the positive relationships with users or clients, proposed by Zimmermann et al. [27] for retail sector workers and then developed by Loera et al. [28] for educational professionals, play an important role in enhancing workers' professional accomplishment. Dealing with people is one of the main reasons reported by some workers in the educational and health sectors for having chosen their profession. In different kinds of people-oriented professions [17, 27–29], workers are offered an indirect reciprocity in terms of meaning in their work and a direct reciprocity in terms of the gratitude and social support expressed by users.

As Zimmermann et al. [27] clearly describe, support from users or clients can perform different functions: instrumental, emotional, cognitive, or informative. Support serves an instrumental function when it helps to solve practical problems through concrete actions. It serves an emotional function if it offers feelings of comfort, caring, or safety or leads people to believe they are admired and valued. Support serves a cognitive or informative function if it

provides knowledge and tips that help people face issues and understand their context. Due to the specific nature of university teacher-student relationships, students can hardly offer instrumental support to teachers. However, students can offer academics forms of emotional support through expressions of recognition and gratitude. They can also sometimes provide cognitive or informative support by making useful information available or by simply avoiding overwhelming teachers with unnecessary or excessive emails or requests. A form of both cognitive and emotional support specific to the teacher-student relationship can then be the evidence of the students' learning and intellectual growth. Indeed, it can represent a source of motivation for teachers, as reported by Darabi et al. [30] and theorized by Hagenauer and Volet [31]. These authors underline the importance of increasing the study of reciprocity in teacher-student relationships in terms of affective and supportive dimensions. In their analyses, they affirm that quality of teaching (by teachers) and learning (by students) can become a virtuous circle only if the two directions of the positive relationship are considered and enhanced. If this circle is achieved, positive satisfaction-related outcomes are likely for all actors.

Therefore, in the theoretical framework of the JD-R model [25], the aim of the present research was to study academics' psychological health by analyzing how teachers' perceptions of emotional exhaustion (impairment process) and work engagement (motivational process) are related to both "classical" demands and resources (content of work and quality of relationships in academia) and the demands and the resources represented by relations with users of the university (the students). More specifically, our hypotheses stated the following.

- (i) H1: Requests referring to content of work (work overload) and to relationships in academia (conflict) are positively related to emotional exhaustion (H1a) and negatively related to work engagement (H1b).
- (ii) H2: Resources referring to content of work (meaningfulness of work) and to relationships in academia (social support from colleagues) are positively related to work engagement (H2a) and negatively related to emotional exhaustion (H2b).
- (iii) H3: Students' excessive demands are positively related to emotional exhaustion (H3a) and negatively related to work engagement (H3b). When considering the relationship with students, the quality of the regression model solution increases (H3c).
- (iv) H4: Students' support is positively related to work engagement (H4a) and negatively related to emotional exhaustion (H4b). When considering the relationship with students, the quality of the regression model solution increases (H4c).
- (v) H5: In line with previous studies [8], since the two separate impairment and motivational processes are determined by the roles of job demands and resources, the demands are more strongly related to emotional exhaustion than the resources (H5a),

and the resources are more strongly related to work engagement than the demands (H5b).

2. Materials and Methods

2.1. Procedure and Participants. During 2017, data were collected in several departments of a large university in northern Italy. An online survey was developed and proposed to teaching and research staff. The questionnaire was composed of a sociodemographic section and scales to evaluate job demands, job resources, and occupational well-being outcomes.

In total, 1012 questionnaires were completed (52% of the entire population). Of these, 550 (54.3 percent of the returned questionnaires) were considered for analysis. The inclusion criterion included fulfilling a minimum 120-hour teaching load for the year. For these academics, their relationships with students are a significant component of their jobs. Moreover, questionnaires with at least one missing piece of data regarding the single items of the considered scales were excluded from the final sample. Therefore, the final sample was composed of the responses of 369 (67.1 percent) associate professors (APs) and 181 (32.9 percent) full professors (FPs). Regarding gender composition, 309 were male (56.2 percent) and 241 were female (43.8 percent). Their mean age was 53 years ($SD = 7.96$).

The entire population was fully informed about the research aims and outcomes. The participants volunteered for the research without receiving any reward, and they agreed to complete the questionnaire anonymously. The research conforms to the Declaration of Helsinki of 1995 (as revised in Edinburgh in 2000), and all required ethical guidelines for conducting human research were followed, including adherence to the legal requirements of the country under study. No treatment, including medical, invasive diagnostics, or procedures causing psychological or social discomfort, was administered to the participants; therefore, no additional ethical approval was required.

2.2. Measures. To evaluate job characteristics, we considered the perception of workload as a job demand and the perception of work as a job resource for university teachers.

- (i) Work overload (WO) was measured using seven items adapted from Melin et al. [32] (e.g., *I work with many different work tasks at the same time.*). The scale ranged from 0 (totally disagree) to 3 (totally agree).
- (ii) Meaningfulness of work (MW) was measured using five items from the Copenhagen Psychosocial Questionnaire [33] (e.g., *I think that my work is meaningful.*). The responses were given on a four-point scale ranging from 0 (totally disagree) to 3 (totally agree).

To analyze the quality of relationships in the work environment, we considered the negative dimension of conflict among colleagues and the positive dimension of perceived social support from colleagues.

(i) Conflict (CO) was measured using four items from the Multidimensional Organizational Health Questionnaire [34] (e.g., *there are people who are marginalized.*). The scale ranged from 0 (totally disagree) to 3 (totally agree).

(ii) Social support from colleagues (SSCo) was measured using four items from the Italian version [35] of the Health and Safety Executive (HSE) Work-Related Stress Indicator Tool [36] (e.g., *I receive the help and support I need from my colleagues.*). The answer scale ranged from 0 (totally disagree) to 3 (totally agree).

Relationships with students were examined by considering both the positive and the negative sides of the relationships. The negative side was examined based on excessive demands posed by the students, which represent a stressful aspect of the relationship. Conversely, the positive side reflects the dimension of support experienced in the relationship with the students. More precisely, the scale evaluates whether academics feel that their work is appreciated and recognized by the students.

- (i) Students' excessive demands were measured using four items adapted from the excessive customer expectations dimension of the Customer-Related Social Stressors (CSS) scale [9] (e.g., *students make excessive demands.*).
- (ii) Students' support was measured using four items adapted from the User-Initiated Support Scale (UISS) [28] (e.g., *students explicitly appreciate my way of working.*).

The responses of both scales were given on a four-point scale ranging from 0 (not at all) to 3 (always).

Occupational psychological health was analyzed using the two dimensions that are the results of the impairment and motivational processes described by the JD-R model [7], respectively.

- (i) Emotional exhaustion (EE) was measured using the corresponding five-item subscale from the Maslach Burnout Inventory-General Survey (e.g., *I feel emotionally drained by my work.*) [37].
- (ii) Work engagement (WE) was measured using the nine-item Italian version of the Utrecht Work Engagement Scale (UWES) [38, 39], which was considered a one-dimensional scale (e.g., *at work, I feel that I am bursting with energy.*).

Responses to the burnout and work engagement measures were provided on a scale ranging from 0 (never) to 6 (every day).

3. Statistical Analysis

Data analyses were performed using the IBM SPSS, Version 25, statistics package for Windows. For each scale of the questionnaire, internal consistency was assessed by the Cronbach's alpha coefficient, and synthetic indexes were

then calculated. After descriptive (mean [M] and standard deviation [SD]) analysis of each synthetic index, hierarchical multiple regression models were performed to evaluate which demands and resources influenced academics' psychological health at work. We specified two separate regression models for emotional exhaustion and work engagement, the two dependent variables. In the hierarchical regression process, predictor variables are added in successive steps (enter method) based on their theoretical status. In the first step, we inserted demographic control variables (e.g., gender, age, and academic role). To control for the covariation between EE and WE, EE was entered at the first step when WE was the dependent variable, and WE was entered at the first step when EE was the dependent variable. In the second step, we added a demand and a resource referring to work content: negative and positive dimensions of relationships within the university context. These represent relationship conflicts among colleagues and social support from colleagues. Finally, in step three, we inserted the negative and positive sides of relationships with external users of the university: exceeding excessive demands (CSS) and social support (UISS) from students. This model estimation process allowed us to evaluate if, after adding new predictive variables, the predictors inserted in the later steps explained a significant portion of the variance over and above the variables inserted at the previous steps. Then, at each step, the holistic fit index useful for evaluating the model's solution quality (R^2 coefficient) can increase (ΔR^2), showing the marginal utility of the most recently added variables.

4. Results

Table 1 shows the results of the correlation analysis between all variables considered for the present study, followed by the means, standard deviations, and Cronbach's alphas. The scales and subscales had adequate internal consistency, and all the variables correlated in the expected direction.

Tables 2 and 3 show the results of the multiple regression analysis. At step one, only the control variables were inserted, namely, age, gender, academic role, EE, and WE, respectively, to control for the covariation between them. Academic role was dummy coded, and the reference category was FPs. Age was not significantly associated with EE, whereas with WE, it was significant only in the first step. Moreover, females were more exhausted and more engaged than men. Regarding academic position, no significant association emerged regarding EE, whereas for WE, it stopped being significant after the first step. Moreover, WE was negatively and significantly associated with EE (Table 3), and EE was significantly and negatively associated with WE (Table 3).

In step two, job characteristics and variables regarding employees' relationships in the work environment were entered. WO had a significant and positive relationship with EE only, while MW showed a negative relationship with EE and a positive relationship with WE.

Moreover, relationship conflict among colleagues (CO) was positively and significantly associated with EE only, whereas perception of social support from colleagues (SSCo) was significantly and positively associated with WE only

(Table 3). The change in R^2 was significant for both the regression models with EE and the model with WE as a dependent variable, increasing when adding the step two variables above to control variables.

Finally, in step three, we entered the relationship with students' variable in its positive and negative aspects, namely, the excessive demands posed by students and the students' support. Specifically, as shown in Tables 2 and 3, CSS had a significant and positive influence on EE only, while UISS had a significant and positive impact on WE only. As the students' excessive demands increased, EE increased, and as students' support increased, WE increased. After considering positive relations with students (UISS), it is noticeable that social support from colleagues (SSCo) showed no further significant impacts on WE in the last step (Table 3). The change in R^2 was significant for both regression models. When adding variables concerning the relationship with students, the increase in R^2 was quite strong for the model with EE as the dependent variable; however, it was less intense for the model with WE as the dependent variable.

5. Discussion and Conclusions

Within the conceptual framework of the JD-R model [7], the aim of the present study was to analyze the role of the quality of relationships with external users, namely, the perceived excessive requests or supportive behavior by students, over and beyond the role of some job demands and resources characteristics. Among these we considered work overload and work meaning, and the negative and positive side of the social work environment, such as conflict relationships with colleagues and support from colleagues.

Results of the hierarchical regression models allowed us to partially confirm our initial hypotheses. Specifically, H1a was fully confirmed, as requests regarding content of work (work overload) and relationships in academia (conflict) were positively related to emotional exhaustion. However, H1b was not proved because the data did not show any significant relationship between work overload or conflict and work engagement at step 2 of the regression model.

H2a was partially confirmed, as meaningfulness of work was related to work engagement, but social support from colleagues was not significantly related to work engagement at step 3 of the regression model. Similarly, H2b was partly verified, as only meaningfulness of work was negatively related to emotional exhaustion.

Moreover, for the academics, the study showed that the relationship with students can represent both a demand, which is associated with higher levels of emotional exhaustion, and a resource, when students are supportive. Student support is indeed positively associated with higher levels of work engagement.

The two hypotheses concerning the relationship with students were thus partially confirmed. H3a and H4a, respectively, were verified, as students' excessive demands were positively related to emotional exhaustion and students' support was positively related to work engagement. However, H3b and H4b were not confirmed: students' excessive demands were not related to work engagement, and students' support

TABLE 1: Descriptive statistics and bivariate correlations.

	1	2	3	4	5	6	7	8	9	10	11
1 Age	1	-.053	.467**	-.154**	-.029	-.057	-.014	-.133**	.074	-.020	-.093*
2 Female		1	-.119**	.030	-.041	.021	-.065	.033	-.041	.048	.127**
3 FP			1	.036	.132**	-.062	.140**	-.036	.068	.114**	-.114**
4 WO				1	-.015	.198**	-.110**	.226**	-.124**	-.037	.415**
5 MW					1	-.172**	.299**	-.210**	.348**	.577**	-.307**
6 CO						1	-.390**	.203**	-.113**	-.190**	.295**
7 SSPo							1	-.107*	.254**	.279**	-.244**
8 CSS								1	-.454**	-.123**	.294**
9 UISS									1	.291**	-.226**
10 WE										1	-.271**
11 EE											1
<i>M</i>		12.77	11.72	3.46	6.09	2.71	6.79	40.04			11.34
<i>SD</i>		3.79	2.63	2.68	2.59	2.01	2.22	9.03			7.07
<i>Alpha</i>		.79	.85	.84	.84	.76	.77	.89			.85

*p < .05; ** p<.01. Gender: 0, M; 1, F. Work role: AP (associate professor), 0; FP (full professor), 1; WO, work overload; MW, meaningfulness of work; CO, conflict; SSCo, social support from colleagues; CSS, students' demands; UISS, students' support.

TABLE 2: Regression parameters: standardized coefficients and overall changes in R² for emotional exhaustion.

	Step 1	Step 2	Step 3
Age	-.076	.003	.020
Female	.133**	.098*	.096*
FP	-.031	-.066	-.073
WE	-.275**	-.105*	-.107*
WO		.191**	.350**
MW		-.245**	-.164**
CO		.145**	.127**
SSCo		-.039	-.039
CSS			.134**
UISS			-.001
Adj. R ²	.095	.304	.318
Δ R ²	.102**	.212**	.016**
R ²	.102	.315	.331

Method: enter.

*p < .05; ** p<.01; *** p<.001. Gender: 0, M; 1, F. Work role: AP (associate professor), 0; FP (full professor), 1; WE, work engagement; WO, work overload; MW, meaningfulness of work; CO, conflict; SSCo, social support from colleagues; CSS, students' demands; UISS, students' support.

did not relate to emotional exhaustion. Notably, regarding work engagement, the significant relationship with support from colleagues disappeared when inserting supportive relationships with students. Also, H3c and H4c found confirmation: the results showed a weak, but significant, increase in the fit of the regression models after the introduction of requests and resources from the relationship with students. The results indicate that students' recognition of teachers' commitment to work and appreciation of the way they work represent a valued resource that could sustain the motivational outcome of work engagement. This is in line with the results of Hamilton's [14] qualitative study.

Moreover, even if EE and WE were related, as shown by the two regression models, the results were in line with previous studies where they represented two independent

constructs [39] that were the results of two independent processes. This confirms H5. Indeed, work overload, conflict, and students' demands were strongly related to emotional exhaustion, whereas only the meaningfulness of work resource had a significant negative role in the impairment process. However, the meaningfulness of work and students' support resources were strongly related to work engagement.

Considering control variables, gender played an influential role in both negative and positive aspects of psychological health at work. This suggests that, for women, the perceptions of both emotional exhaustion and work engagement were higher. Regarding the academic role, full professors were significantly more engaged than associate professors, even if this relationship disappeared when the job demands and resources roles were assessed.

TABLE 3: Regression parameters: standardized coefficients and overall changes in R² for work engagement.

	Step 1	Step 2	Step 3
Age	-.108*	-.029	-.030
Female	.095	.097**	.098**
FP	.145**	.050	.050
EE	-.277***	-.098*	-.100*
WO		-.025	.024
MW		.512***	.490***
CO		-.043	-.056
SSCo		.091*	.072
CSS			.068
UISS			.112**
Adj. R ²	.091	.355	.362
Δ R ²	.98***	.267***	.009*
R ²	.098	.365	.375

Method: enter.

*p < .05; ** p < .01; *** p < .001. Gender: 0, M; 1, F. Work role: AP (associate professor), 0; FP (full professor), 1; WE, work engagement; WO, work overload; MW, meaningfulness of work; CO, conflict; SSCo, social support from colleagues; CSS, students' demands; UISS, students' support.

Overall, the results of the present study were consistent with Mudrak and colleagues' study [6]. This research was conducted in the Czech Republic, and it analyzed academics' occupational well-being. After the changes that have impacted university systems, such as funding reduction and workload increases for academics who have to simultaneously manage teaching, research, and bureaucratic and fundraising activities, academics' psychological health has indeed become a topic of attention. Nevertheless, until now, academics' occupational well-being has not been widely analyzed in terms of the specific demands and resources that characterize their work environment. Therefore, our work offers a further contribution to deepening and refining the focus on a cultural context that, compared with the Anglo-American one in which most of the studies have been conducted, is still underrepresented in this field of research.

Considering occupational psychological health in the conceptual frame of the JD-R model [7, 25], only demands and resources related to job content and relations inside the organization are traditionally considered—even for professionals and academics [6] who spend a considerable part of their activities relating with users. External users are sometimes considered sources of requests [18, 24] but are much more rarely considered sources of social support [27, 28]. Moreover, the present study showed the relevance of the positive side of the academic-student relationship. In a historical period that poses numerous requests and challenges to academics, it should be underlined how the relationship with students represents an important source of support, which, according to previous studies, is the core of the teaching role [30].

Finally, this study is not without limitations. First, it involved only academics from an Italian university, so results cannot be generalized. Future works could involve participants at universities in several regions of Italy and possibly other countries. Second, future studies should also consider a wider plethora of job demands and resources that are specific

to the academic context, such as work-family conflict or the role of the multiple academic tasks related to teaching, research, and third-stream activities. Moreover, the study is cross-sectional, so the direction of the explored relationships could not be verified. In the future, we can utilize repeated administrations of the instrument to analyze these results over time.

Despite these limitations, the present study is valuable, as it offers an analysis of the still underexamined topic of academics' psychological health at work using a renewed and ductile conceptual frame, the JD-R model, in line with Mudrak et al's work [6]. This research design can also be adopted in other countries to study demanding and supportive aspects of the university environment to improve occupational well-being for academics.

Data Availability

Datasets supporting the conclusions of this article are available and can be requested from the corresponding author.

Disclosure

The research is a part of a larger study performed at the University of Turin.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Research Article

Long Hours' Effects on Work-Life Balance and Satisfaction

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Purpose. In this study, we examined whether the associations between working hours, job satisfaction, and work-life balance are mediated by occupational stress. In addition, we tested whether perceived time control helps moderate the effects of working hours and occupational stress. **Methodology.** Questionnaires were administered to 369 respondents working in the high-tech and banking industries. Analyses were then conducted on the data. **Findings.** The analysis revealed significant correlations between long working hours and both occupational stress and work-life balance, as well as between occupational stress and both work-life balance and job satisfaction. In addition, the relationship between working hours and occupational stress exhibited a significantly positive interaction with perceived time control. **Value.** The results indicate the importance of giving workers greater control over working hours. We therefore recommend that labor laws should be revised as necessary to prevent excessive working hours and enhance work-time flexibility.

1. Introduction

1.1. Long Work Hours. Workers in Taiwan are commonly required to work long hours by their employers. The results of a survey by Taiwan's Ministry of Labor, for example, indicated that, in 2014, employees in Taiwan worked an approximate average of 2134.8 hours, a yearly total similar to, but somewhat higher than, those of workers in South Korea and Japan (2124 and 1729 hours, respectively) ("The OECD Teaching," n.d.) [1]. Indeed, about 25% of Taiwanese workers are obligated to work excessive hours, in spite of the fact that excessive working hours are prohibited by Taiwan's Labor Standard Act. Moreover, of those workers, approximately half indicated that their excessive work hours negatively impacted their health ("The OECD Teaching," n.d.).

1.2. Leisure in the Work-Life Balance and Job Satisfaction of Employees in Industries with High Occupational Stress. Past investigations have found that both work-life balance and job satisfaction are impacted by overtime work [2, 3]. At

the same time, the relationships between prolonged working hours and occupational wellbeing, health, and quality of life are not yet completely clear, although previous studies have found that excessive working hours can lead to a number of specific health issues, including depression, anxiety, and sleep disturbances [4, 5]. Relatedly, expending excessive amounts of energy at work has been found to result in various physical reactions, including fatigue and physiological activation. Associations have also been found between employees who engage in overtime work without corresponding improvements in productivity and an elevated risk of voluntary unpaid overtime work and reduced quality of life at home.

The role of work in employees' lives has also been significantly affected in both positive and negative ways by technological advances and globalization. For example, competitive employment pressures have increased even as various social reforms have been manifested. As a result of such pressures, job burnout has become a growing problem, particularly in high-pressure fields such as the banking

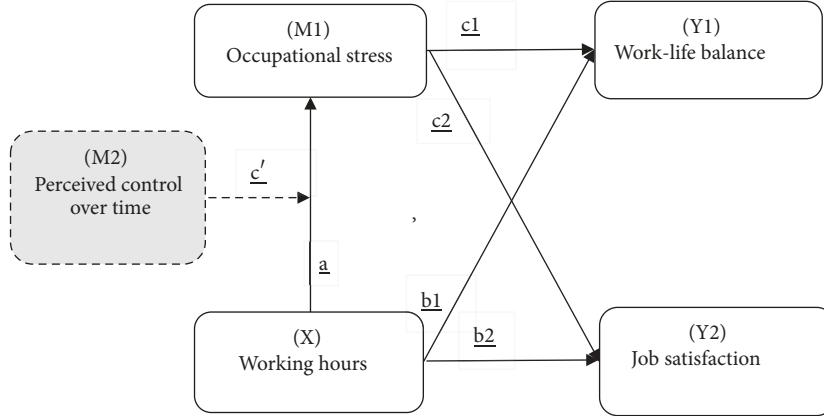


FIGURE 1: Tested conceptual model.

and technology industries [6, 7]. Bank jobs involve both substantial financial stakes and considerable interpersonal pressure, conditions that can result in long-term energy depletion among bank sector employees. Tech industry workers, meanwhile, face almost constant pressure to innovate their products and rapidly adapt to the constantly evolving technological landscape.

1.3. Effort-Recovery Model. The effort-recovery model provides a useful framework for explaining how the effort expended by an individual on work or nonwork activities may eventually damage the individual's health through a series of psychological, physiological, and behavioral processes. Meijman and Mulder [8] explained the effort-recovery model, which posits that if employees achieve psychological detachment from their work during nonworking hours, it will enhance their productivity during working hours. Relatedly, Etzion et al. [9] reported that such detachment from work acts as a moderator of the relationship between burnout and various stressors; psychological detachment is believed to play a protective role against various negative impacts among workers who have low levels of control over their work. In addition, recovery has been found have significant effects on the maintenance of occupational wellbeing, particularly among workers who work in highly stressful environments and occupations [10–12].

1.4. Summary. The main objective of this study was to develop the effort-recovery model and the control of occupational stress into a theoretical framework, which is shown in Figure 1. The four main research questions were as follows. (1) Do long work hours affect occupational stress (see path a)? (2) Do long work hours affect work-life wellbeing (i.e., work-life balance and job satisfaction) (see paths b1 and b2)? (3) Can occupational stress mediate the relationship between working hours and work-life wellbeing (i.e., work-life balance and job satisfaction) (see paths c1 and c2)? (4) Can perceived control over time moderate the relationship of working hours with occupational stress (see path c')?

According to our conceptual model, the causal effects of long work hours can be apportioned into its indirect effects

on the dependent variables through mediators ($a \times c1$) ($a \times c2$) and into its direct effects on the dependent variables (paths b1 and b2). Path a represents the effect of work hours on the proposed mediator, and paths c1 and c2 represent the effects of the mediator on the dependent variables, through which the effects of long work hours are effectively portioned out. (Note: path c' connects to the solid boxes indicating the main concepts of the model, while the dotted box around "perceived control over time" indicates that it acts as a moderator [M2] of the effects contributing to and resulting from working hours and occupational stress.)

2. Materials and Methods

2.1. Design and Participants. To investigate the health of overtime workers in the high-tech and banking industries in Taiwan (both of which have high proportions of workers who work long hours), this study utilized a cross-sectional design. A total of 369 exempt employees ranging in age from 20 to 65 years old were recruited. This recruitment was conducted over two distinct periods, with 193 participants being recruited at high-tech industries during the first recruitment period and 176 participants being recruited at banking industries during the second recruitment period. The institutional review board of National Chengchi University in Taiwan approved the study, and all of the participants provided informed consent.

2.2. Measurements and Instruments

2.2.1. Measurement Scale. A total of four questionnaires regarding occupational stress levels, work-life balance, job satisfaction, and perceived control over time were administered (though again, only some of the participants received the questionnaire regarding their perceived control over time).

2.2.2. Job Stress Questionnaire. The job stress questionnaire developed by Cooper and Marshall [13] contains four subscales: excessive role load, low technical use, and role conflict, and the role is blurred. The reliability Cronbach's alpha level

of the questionnaire was found to be 0.79, indicating that it is an appropriate means of assessing the degree of psychological pressure faced by workers [14]. This questionnaire includes 15 items, each of which the participants rated using a 5-point Likert scale.

2.2.3. Work-Life Balance Questionnaire. The work-life balance questionnaire used in this study to gather information on the participants' schedules and the balance or lack thereof between their work and free time has also been used in previous studies [15, 16]. This scale also consists of 15 items, each of which the participants rated using a 7-point Likert scale, where 1 indicated "never" and 7 indicated "always." The higher the score, the greater the degree of work-life imbalance experienced by the workers.

2.2.4. Job Satisfaction Questionnaire. The job satisfaction questionnaire used in this study, which has previously been reported to have an overall Cronbach's alpha coefficient ranging from 0.73 to 0.78 [17, 18], was used to measure the participants' job satisfaction [19]. To that end, the scale is divided into the following six topics: colleagues, supervisors, income, promotion opportunities, work, and overall job satisfaction. The participants used a 5-point Likert scale to rate each of the items in these topic categories.

2.2.5. Perceived Control Over Time Questionnaire. The perceived control over time scale used in this study, the items of which were also rated using a 5-point Likert scale, was based on the Time Management Behavior Scale developed by Macan et al. [20], which has previously been reported to have an overall Cronbach's alpha coefficient of 0.68. This Cronbach's alpha coefficient indicates that the scales and subscales of the overall scale are reliable and that the scale is an appropriate means of assessing the degree to which workers feel that they are in control of their own working hours.

2.3. Statistical Analysis. The demographic statistics (gender) of the study participants are presented in percentages. A descriptive analysis was conducted to determine the distribution of the data from the four questionnaires. An examination of the raw data in four scales carried out prior to data analysis revealed that less than 1% of the data were missing. Normality test in four scales was examined. Natural logarithm transformation was performed if the normality assumption did not fit. Bivariate Pearson's correlations were used to explore the relationships between scales. Finally, path analyses were conducted to determine any cause-and-effect relationships among the concepts measured by scales from the questionnaires. A linear regression analysis was performed to evaluate the relations between a dependent variable and one (simple linear regression) or more (multiple linear regression) explanatory variables. More specifically, the structural model was calculated in order to determine the statistical significance, if any, of the path coefficients between the various observed variables. In the mediation process, the relationship between the independent variable (X) and the dependent variable (Y) is hypothesized to be an indirect effect

(path c') that exists due to the influence of a third variable. The minimum sample size for principal components analysis was estimated by 30-50 observations of 4 variables, for a total of 120-200 observations. SAS 9.3 was used in all the analyses, and the alpha value was set at 0.05.

2.4. Ethics. Ethical approval for this study was obtained from the Research Ethics Committee, National Chengchi University, Taipei, Taiwan Joint Institutional Review Board (approval no. NCCU-REC-201508-I042).

3. Results

3.1. Participant Characteristics. The demographic information of the study participants is shown in Table 1. The mean age of the 369 total participants was 36.11 ± 7.34 years, while 184 (49.9%) of the participants were women and 185 (50.1%) were men. In terms of marital status, 50.4% of the participants were single, 46.3% were married, and 2.7% were divorced. Furthermore, approximately 48.5% of the workers had more than 5 years of seniority in their workplaces. These participants reported spending an average of 46.21 ± 8.21 (range: 24-98) hours per week at work. They also reported working days of 5.07 ± 0.42 (range: 3-7) days per week. In terms of the working hours of the study participants, the results indicated that the mean scores for occupational stress ($p < 0.001$) and work and life balance ($p < 0.001$) were significantly higher for those who worked overtime (≥ 40 hrs) than for those who did not work overtime. However, the perceived control over time results was comparatively lower for the overtime work subgroup (see Table 2).

3.2. Correlations between Study Variables. The correlation matrix for this study is displayed in Table 3. There were significant and positive correlations between working hours and occupational stress ($r = 0.220, p < 0.01$) and between working hours and work-life balance ($r = 0.270, p < 0.01$), specifically, the results revealed that higher working hours caused higher levels of occupational stress and greater work-life imbalance. In contrast, there were significant and negative correlations between age and working hours ($r = -0.129, p < 0.05$), between age and occupational stress ($r = -0.144, p < 0.01$), and between working hours and perceived control over time ($r = -0.189, p < 0.05$). Interestingly, there was no significant correlation, either positive or negative, between working hours and job satisfaction. Meanwhile, there were significant and negative associations between perceived control over time and occupational stress ($r = -0.683, p < 0.01$) and between perceived control over time and work-life balance ($r = -0.513, p < 0.01$), whereas perceived control over time was positively correlated with job satisfaction ($r = 0.395, p < 0.01$). Higher levels of perceived control over time seemed to have the effect of lowering occupational stress while increasing both work-life balance and job satisfaction. At the same time, occupational stress was significantly and positively correlated with work-life balance ($r = 0.460, p < 0.01$), while being significantly and negatively correlated with job satisfaction ($r = -0.553, p < 0.01$). Due to relatively weak

TABLE 1: Demographics of the participants(n = 369).

Variables	N	%
Gender		
Male	185	50.1
Female	184	49.9
Marital		
Single	186	50.4
Married	171	46.3
Divorced	10	2.7
Widowed	1	0.3
Cohabiting	1	0.3
Education level		
Junior high school	4	1.1
Senior high school	14	3.8
College	187	51.1
Masters/Doctorate	161	44
Seniority in the workplace		
<1 year	54	14.6
1-4 years	136	36.9
5-9 years	87	23.6
10-14 year	61	16.5
15+ years	31	8.4
Shift work		
No	364	98.6
Yes	5	1.4
Variables	Mean	SD
Age (years)	36.11	7.34
Hours of work per week	46.21	8.21

TABLE 2: Comparison of work-related factors between participants who reported working overtime and those who did not.

Variables	Score Range	≥48hrs (n=241)		≤48hrs (n=128)		P
		Mean	SD	Mean	SD	
Occupational stress (OS)	15~75	45.12	7.36	41.30	7.94	<.001
Perceived control over time (PCT)	5~25	15.36	2.77	16.52	2.79	0.01
Work and life balance (WLB)	15~105	57.65	8.75	51.59	8.95	<.001
Job satisfaction (WSA)	6~30	19.43	3.92	20.12	4.05	0.11

Independent Sample t-test was used.

TABLE 3: Pearson correlation coefficients between working hours, perceived control over time, occupational stress, work-life balance, and job satisfaction (N =369).

	Age	HOUR	PCT	OS	WLB	WSA
Age	1					
HOUR	-.129*	1				
PCT	-.064	-.189*	1			
OS	-.144**	.220**	-.683**	1		
WLB	-.089	.270**	-.513**	.460**	1	
WSA	.070	-.051	.395**	-.553**	-.205**	1

Hour = working hours; PCT = perceived control over time; OS = occupational stress; WLB = work-life balance; WSA = job satisfaction. *p < 0.05; **p < 0.01;
*** p < 0.001.

TABLE 4: Regression analyses results indicating the effects of occupational stress as a mediator of the associations between work-life balance, working hours, and job satisfaction (N=369).

		Independent Variables	Dependent Variables	β	t	p	R^2	F
Model 1	Path a	HOUR(X)	OS(M1)	0.22	4.317**	<.001	0.048	18.64
Model 2	Path b1	HOUR(X)	WLB(Y1)	0.177	3.798* **	<.001	0.241	58.02
	Path c1	OS(M1)	WLB(Y1)	0.421	9.004* **	<.001		
Model 3	Path b2	HOUR(X)	WSA(Y2)	0.074	1.67	0.096	0.311	82.46
	Path c2	OS(M)	WSA(Y2)	-0.569	12.789* **	<.001		

Hour = working hours; PCT = perceived control over time; OS = occupational stress; WLB = work-life balance; WSA = job satisfaction. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

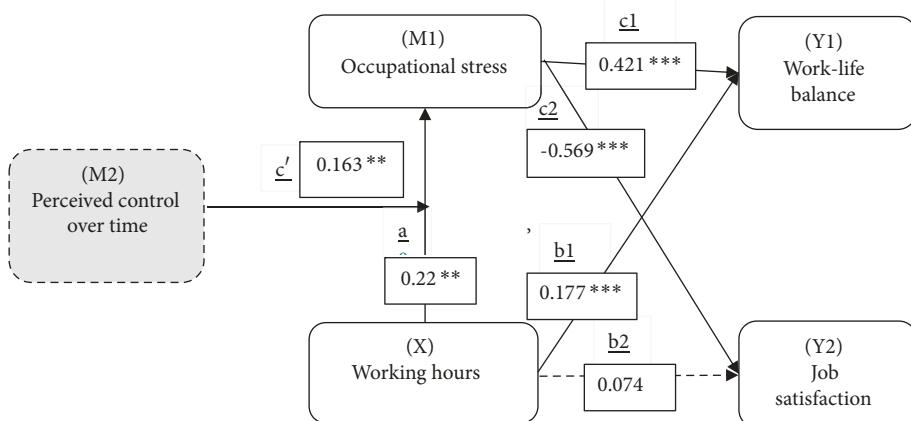


FIGURE 2: Path analysis and path coefficients for the mediating and moderating impacts of results (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$).

correlation, the correlations between them did not change after adjusting age.

3.3. Tests of Mediation. The path analysis results are presented in Table 4 and Figure 2. According to those results, working hours had a significant effect on both occupational stress ($\beta = 0.220$, $p < 0.01$) and work-life balance ($\beta = 0.177$, $p < 0.001$), while occupational stress had a significant effect on both work-life balance ($\beta = 0.421$, $p < 0.001$) and job satisfaction ($\beta = -0.569$, $p < 0.001$). All the paths revealed by the analyses indicated that working hours had seminal effects on occupational stress, work-life balance, and job satisfaction. Sobel test results showed that occupational stress acted as a partial mediator ($z = 3.913$, $p < .001$) between work-life balance and working hours and as a full mediator ($z = 4.124$, $p < .001$) between job satisfaction and working hours.

3.4. Tests of Moderator. The term “moderator” is used to refer to any quantitative or qualitative variable that has an effect or effects on the direction and/or strength of the association between a dependent or criterion variable and a corresponding independent or predictor variable. In the specific context of a correlational analysis framework, a moderator consists of a third variable that exerts an effect on the zero-order relationship between two other variables [21].

In testing the moderator effects, the current study used the data from the second recruitment period alone (N = 176), as only the participants recruited in that period answered

the questionnaire regarding perceived control over time. As indicated by the results listed in Table 5, perceived control over time acted as a moderator between work-life balance and working hours, with long working hours resulting in high occupational stress and high perceived control over time. In other words, those workers who have higher perceived control over time have a greater likelihood of being affected by the number of hours they work than do those workers with lower levels of perceived control over time. In summary, higher levels of perceived control over time result in lower occupational stress in employees; however, those employees with higher levels of perceived control over time are also more likely to face the effects of long working hours.

4. Discussion

To the best of our knowledge, this study constitutes the first investigation of occupational stress that has made use of both perceived control over time as a moderator and cross-sectional mediation in order to investigate the experiences of high-tech and banking industry employees. The study results indicated that occupational stress acts as mechanism in the links between working hours and work-life balance and job satisfaction. According to our results, problems in occupational stress and alertness resulting from being burdened with higher working hours seem to have many harmful ramifications for work-life wellbeing, such as work-life imbalance and job dissatisfaction. Furthermore, those participants who reported having high perceived control over

TABLE 5: Regression analyses results indicating the effects of perceived control over time as a moderator of the association between occupational stress and working hours (N=176).

Independent Variables	Dependent Variables	β	t	p	R^2	F
HOUR (X)	OS (Y)	0.132	2.3779*	0.019	0.510	59.304* **
PCT (M2)		-0.655	-11.976* **	< .001		
HOUR * PCT		0.163	2.994**	0.003		

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

time were less prone to also report having highly stressful workloads or long working hours.

In previous studies, it was found that long working hours were associated with job-related role stressors (including workload, role ambiguity, and role conflict). As such, workers usually be divorced of work pressures during off-job time and recovery-related self-efficacy [11]. In another study, it was also shown that highly stressful jobs and quantitative workloads have been found to be associated with poor health [22, 23], poor quality of life, and low levels of occupational wellbeing [6, 10, 24–26].

Our results imply that occupational stress acts as a partial mediator between work-life balance and working hours, while also acting as a full mediator between reported job satisfaction and working hours. These findings seem to indicate that both work-life balance and job satisfaction are decreased by longer working hours, while also suggesting that occupational stress plays a key role in workers' performance. These findings are consistent with those of past reports regarding people working in a variety of other industries [6, 23, 24]. For example, in a study of Japanese managers, Maruyama and Morimoto found potential associations between long working hours and low quality of life, poor lifestyles, and high stress. In another study, Liu et al. found that job stress, insufficient social support, and work-life interference are all problems affecting underground coal miners [24, 27]. Relatedly, interference in family life caused by work has been identified as a mediator of the on-call occupational stress faced by physicians [28]. In effect, the amount of time that workers are able to spend with their families is reduced by having longer working hours, and this reduced family time leads to a poor work-life balance that, in turn, ultimately affects the productivity levels of those workers.

A previous study found that occupational stress is affected by a worker's level of perceived control over his or her time [10]. Relatedly, another past study reported that the job stress experienced by workers is moderated by the degree to which they detach from their work during their nonworking time [11]. In addition, a previous study suggested that work-family conflict could be reduced by increasing employees' opportunities for control over their work procedures in organizations, as such control seems to be directly related to less problems in combining work and family roles [29]. Based on these findings, we recommend that labor and healthcare regulators should consider introducing regulations and policies that effectively reduce working hours, including regulations and policies regarding the use of telecommuting, flexible work scheduling and vacation, and childcare services. By thus providing workers with greater capacity to manage their

working hours, the job stress experienced by workers could be reduced. The provision of mental counseling services, stress relief and sports courses, and employee networking and tourism activities could also be helpful in this regard, benefitting workers in terms of their health, quality of life, and occupational wellbeing.

5. Study Limitations

There were several limitations to this study. First, the sample of participants came exclusively; the high-tech and banking industries and the workloads of employees in those industries typically vary on a seasonal basis. As such, it may not be appropriate to generalize the study findings to other industries. With that in mind, future research focused on other industries and occupations that also require long working hours (e.g., certain roles in healthcare or law enforcement) would be worthwhile, as would investigations aimed specifically at measuring the job stress and psychological conditions of workers who work over 60 hours each week. A second limitation of the current study is that it was a cross-sectional study. Because of that, it is not possible to make any causal interpretations regarding the associations among the number of hours worked, work-life balance, occupational stress, and job satisfaction. Accordingly, future studies that utilize either an experimental or longitudinal study design would be worthwhile.

6. Conclusions

In conclusion, this study found evidence that occupational stress acts as a powerful mediator of the relationships among long working hours, work-life imbalance, and job dissatisfaction in employees in high-stress industries such as the high-tech and banking industries. Furthermore, it is possible that perceived control over time plays a protective role that affects recovery-related self-efficacy in the face of long working hours and occupational stress. From a welfare of workers perspective, a focus on developing more optimistic attitudes in organizational contexts can promote physical and mental health through time management, stress management, leisure arrangements, etc., thereby enhancing workers' sense of control over their working hours and work-life, increasing their healthy behaviors, and enhancing their quality of life and competitiveness.

Data Availability

The data used to support the findings of this study are included within the article.

Disclosure

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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Research Article

Comparability of Self-Ratings and Observer Ratings in Occupational Psychosocial Risk Assessments: Is There Agreement?

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Objective. The suitability of self-ratings and observer ratings within organisational management approaches is controversial. The aim of this study was to compare the degree of agreement between self-rated and observer-rated occupational psychosocial demands. The comparison took place within a work-activity and not worker-centred assessment, according to official policies for psychosocial risk assessment. Through simultaneous application of two versions of the same instrument, we aimed to reduce the rating bias to a minimum demonstrating the suitability of self-ratings and observer ratings in companies of all kinds. **Methods.** A multimethod online assessment of 22 different work activities was conducted in Germany from October 2016 to October 2017. Workers (self-ratings) and occupational safety and health (OSH) committees (observer ratings) rated the occupational psychosocial risks of each activity with the same instrument ($N = 669$). The instrument measured psychosocial risk conditions at work. Reliability and agreement indices were computed. **Results.** The within-group agreement (WGA; $r_{wg,mean} = .42$) of the workers' self-ratings was good for each psychosocial risk and the interrater reliability (IRR) was excellent on average ($ICC\ 2 = .77$) with a medium effect size of $ICC\ 1 = .15$. The interrater agreement (IRA) between the two groups varied across the activities depending on rating group and activity composition (from $ICC_{unjust,mean} = .39$ to $ICC_{unjust,mean} = .86$) but was good to excellent on average ($ICC_{unjust,mean} = .71$). **Conclusion.** The reasonable agreement and excellent reliability in workers' self-ratings justify aggregation of item means at the group level. Furthermore, if the work activities are homogenous and the committee consists of members from different OSH specialties, observer ratings and self-ratings provide comparable results. According to this study's results, both methods are reliable assessment strategies in the context of psychosocial risk assessment. The observer rating approach is especially suitable for small-to-medium enterprises that do not have access to a large anonymous survey assessment.

1. Introduction

There is an increasing interest at governmental level (both national and European) in reducing workplace absenteeism and work disability due to adverse (psychosocial) working conditions [1]. A risk assessment, also for psychosocial job demands, is formally standardized in many European countries [2]. However, less than 30% of European companies have implemented measures dealing with psychosocial risks within an organisation-centred management approach [3]. Among those who have, the majority are large enterprises. The strongest drivers of psychosocial risk management are management commitment and employee involvement [4].

Employees can be involved in work councils, OSH committees, or as health and safety representatives. Manager commitment can be encouraged by awareness campaigns. Economic aspects should also be taken into account, for example, by presenting cost-effective assessment approaches. This is because organisations invest less in OSH prevention in times of a recession or economic crisis [4]. This finding is particularly alarming because employees more frequently report psychosocial risks and strain [5, 6] during times of insecure employment. For instance, insomnia ratings were greater among nurses who experienced a pay cut than among nurses whose payment conditions had not changed [7]. If supervisors were trained in interactional justice (i.e.,

an intervention aimed at improving psychosocial working conditions), the degree of insomnia and thus the individual strain response decreased faster than for nurses whose supervisors did not receive a training. Thus, the assessment of psychosocial risks during crisis time appears to be a strategic topic [8]. Furthermore, it is essential to involve workers and supervisors in the management process.

The most utilized instruments in identifying psychosocial workplace demands are self-rated questionnaires, because they are inexpensive and easy to quantify and analyse statistically [9]. This has led to a person-centred approach to managing psychosocial risks. However, it is up for debate to what extent self-ratings reflect the objective working conditions [10]. The self-report bias, also known as subjectivity bias, is one of the main concerns regarding self-ratings [11]. Procedures subject to this bias are supposed to be “less objective.” Bias occurs if the characteristics of an individual (e.g., current state of health, expectations, and personality) affect the response of this individual [12]. However, in the context of an organisational management approach to psychosocial risks, it is crucial that measures have an effect as closely as possible on the cause. The main cause is not the individual worker but the working conditions. Therefore, working conditions should be assessed objectively so that the management can react to them appropriately. Objective measures can contribute to a clearer linkage between the subjective perception and the activity conditions [13].

Observation-based assessments are argued to be “more objective” than self-ratings. Observer ratings carried out by OSH experts have three advantages over worker self-ratings [14]. First, due to their years of experience in observing work activities, experts (e.g., occupational health physicians, health and safety experts, and industrial and organisational psychologists) are familiar with the psychosocial conditions of different activities in different companies. Second, as they do not have authority to issue directives to workers, they might be more neutral in their observation as are personnel managers and supervisors. Third, in cases where joint OSH committees of experts and management teams rate working conditions, they might reduce rating bias of supervisors and employees. In addition, since large anonymous surveys require a higher participation rate, to ensure the anonymity of employees, observer ratings are better suited to small and medium sized companies, which lack the amount of workers for an anonymous survey report on their work-specific psychosocial demands. Despite these advantages, observer-ratings have rarely been used to assess psychosocial working conditions [14]. The reason for their scarce use might be that existing instruments are not user friendly, but time consuming, difficult to conduct and interpretation requires the knowledge of industrial and organisational psychologists [15].

In relation to item formulation, the biggest difference between both methods is that observer ratings are formulated in the third-person perspective (e.g., PsyHealth [16]; e.g., “the activity requires [...]” or “within the activity it is [...]”). On the other hand, self-ratings are presented in the first-person perspective (e.g., Work Design Questionnaire, WDQ [17]; e.g., “the job allows me [...]”). Comparative analyses between

self-ratings and observer ratings reveal high associations between both methods for job demands that can be observed (e.g., items referring to task complexity, decision latitude, and work environment), whereas low associations have been found for job demands that are less easy to observe and temporally unstable (e.g., items asking about responsibility and time pressure) [18]. Different explanations are possible. In addition to subjectivity bias, the observability of job demands and theoretical conceptualization are mentioned as reasons for differences [19]. For instance, if job demands are conceptualized, in items like “due to the high volume of work, there is a high time pressure,” the person-centred interpretation of items and not the work-related demands are assessed [12]. For these reasons, we argue that within-group agreement is a suitable criterion to evaluate if self-ratings are subjected to the subjectivity bias. A high degree of agreement is a prerequisite for grouping individual values to form a group average [20]. Furthermore, it is suggested by the literature that “conditions (e.g., task conflicts, work interruptions, multitasking, etc.) leading to high job demands are observable, and they might be more appropriate for observation-based measures” [19, p. 198]. We agree that you cannot observe every demand at every time for any work activity, but you can ask experts to rate the demands. We attribute the expert role not only to the employees but also to the OSH experts who also have experience with the activity and the operational procedures. This statement is supported by a meta-analysis of job analyses comparing data sources, workers, analysts, and technical experts for instance. The results demonstrate that, as a data source, workers were less reliable than analysts [21]. Another meta-analysis on job analyses has shown that the number and the time of experience of evaluators are important for reliability [22]. Observer ratings are reliable, if experienced professionals evaluate work activities based on observation and not only on job descriptions [22]. Furthermore, if nonprofessionals carry out the ratings, with a minimum number of 2 to 4 evaluators, a reliability coefficient of .80 is obtained. Overall, a mean reliability around .60 has been identified [21, 22].

Currently, there is no method guaranteeing “objective” measurement [23]. Whether the evaluator is an expert, manager, or worker, there will always remain a rater bias due to the emotional and cognitive evaluation of responses [24]. However, there are methodological solutions to improve reliability and validity of ratings. Scholars have demonstrated that questionnaires with items that are fact-based reduce subjectivity bias and enhance the convergence between self-ratings and observer ratings. For instance, Spector and Fox (2003) minimized the subjectivity bias in the assessment of autonomy by designing scales in which items asked more fact-based and focused questions. In order to test convergent and discriminant validity, they asked workers and supervisors to rate the autonomy of the same job with their new autonomy scale (Factual Autonomy Scale, FAS) and with the autonomy scale of the Job Diagnostic Survey (JDS). FAS ratings of workers and supervisors correlated significantly ($r=.53$, $p>.05$) [25]. If one wants to assess psychosocial working conditions, fact-based items with reference to the working conditions are preferable. The conditions are of key interest,

since occupational risks should be prevented at their source [26]. Condition-related self-ratings of the workers as well as condition-related observer ratings are possible methods [12]. Existing instruments that have a self-rating and observer rating version (e.g., ISTA [18]) differ in relation to the perspective of the item formulation and the item numbers. They are not identical in both versions.

Considering the advantages and limitations of both methods, the simultaneous use of observer ratings and workers' self-ratings seems to be a promising strategy for an accurate assessment of psychosocial demands in psychosocial risk assessments [27]. Therefore, the present study describes the comparability of the results of an economic occupational psychosocial risk assessment presented as a self-rating and observer rating version.

Through analysing the comparability of self-ratings and observer ratings, the aim of our study is to promote more objective advances in measuring psychosocial demands within a work-centred approach. We operationalized comparability with different agreement measures for absolute consensus between different raters and reliability with measures for relative consistency of the rank order [28]. We first wanted to know if workers agree on the frequency of psychosocial work. Agreement determines whether the rating of one individual worker corresponds to the ratings of the other workers with the same activity. Second, we wanted to know whether agreement depends on the affiliation to the work activity rated. In other words, we analysed whether the activity explains individual differences in the workers' responses. If these two criteria are fulfilled, self-ratings are reliable sources and suitable measures for risk assessments; thus the subjectivity bias is negligible. Furthermore, in the third step, we wanted to know whether the results of the worker's self-ratings are comparable to observer ratings of OSH committees. This finding would further stress the point that risks can be collected independently of the rater. Furthermore, it promotes a multidisciplinary management approach that takes different perspectives into account by involving different organisational specialties (e.g., staff council representatives, supervisors, occupational safety, and health experts).

We formulated the following hypotheses. Our first hypothesis is that workers of the same work activity rate psychosocial demands with good agreement (*hypothesis 1*). The second hypothesis is that the workers' self-ratings are reliable (*hypothesis 2*). Third, we hypothesise that the average agreement between workers' self-ratings and observer ratings of the same work activity is good (*hypothesis 3*).

2. Materials and Methods

We collected the data during a two-year cooperation project between the study centre and a social accident insurance. The study was advertised by the social accident insurance in their membership magazine. The participants were thus jobholders of those companies. PhD projects delivered additional data from the local area of the study centre. Data was collected

with a self-programmed software [29] from October 2016 to October 2017 via the online instrument PsyHealth [16].

2.1. Participants. The sample consisted of two rating groups: self-ratings of workers ($N = 598$) and observer ratings of occupational safety and health (OSH) committee members ($N = 71$). Each group rated the same activity within their respective organisation. Overall, 22 different activities were rated in 11 different organisations. The activities ranged from administrative tasks in the service sector to manual activities in production. You can find an overview of all activities assessed in the present study in the first column of Table 2. For privacy protection within the companies, all self-rating groups consisted of at least 10 workers. The composition of each OSH committees varied. In most cases, committees included supervisors, staff council representatives, safety representatives, occupational physicians and safety officers, and representatives of the human resource department. Table 2 provides also an overview of the individual committee composition for each activity (see the notes of Table 2).

2.2. Procedure. The occupational psychosocial risk was assessed with the instrument PsyHealth, a custom-built software solution for online assessment of psychosocial work conditions. The instrument has been designed as a tool for psychosocial risk assessment for both workers' self-ratings and committee observer ratings. For 48 items, participants have to indicate how often each psychosocial working condition occurs while conducting the work activity. The response scale ranges from 0 ("at no time or some of the time") to 3 ("most or all of the time"). Some items have been reverse-coded in order to avoid response bias. All items are formulated condition-related and are coded in a way where higher values represent better working conditions. The items and response scales are identical for both versions. Thus, the degree of agreement clearly depends on the raters and not on the number of items or perspective. That is why PsyHealth is particularly suitable for analysing comparability of self-ratings and observer ratings.

The invitation to the survey was sent by e-mail with a link to the software. Jobholders and observers received different access codes and were matched by company and name of activity. In order to guarantee the anonymity of the participants and to foster trust, we have not assessed any personal data. Prior to the online assessment, all participants gave their informed consent to their participation in the study. Participation was voluntary. No ethical statement was necessary since we did not collect any sensitive data and data collection was completely anonymous (the codes for company workers were identical for each company, so that it was not possible to track an individual response back to the worker).

2.3. Statistical Analyses. For testing our hypotheses, we used the package multilevel 2.6 [30] in R Version 3.3.3 [31]. The multilevel package provides agreement and reliability measures representing the variance in any worker's response that might be explained by the activity.

To test *hypothesis 1* we calculated r_{wg} [32] as a measure of within-group agreement (WGA) of self-ratings on the item level. r_{wg} determines whether the work activity rating of one individual corresponds to the ratings of the others with the same work activity. Dunlap et al. (2003) showed that the 95% confidence interval for the single item r_{wg} varies as a function of group size and the number of response options [33]. We provided the appropriate cut-off values for the current assessment with a four-point frequency scale and an average group size of 27 raters. Based on 10,000 simulations .22 is the 90% confidence interval (CI) estimate for low agreement, and .28 is the 95% CI estimate for good agreement. The 99% confidence interval value indicating very good agreement is .38.

For testing *hypothesis 2* intraclass correlation coefficients (ICC) 1 and 2 (*ICC 1* and *ICC 2*) from ANOVA models were computed. *ICC 1* values may be interpreted as an effect size estimate. According to LeBreton and Senter [28], small effects are indicated by values around .01, medium effects by .10, and large effects by .25. The *ICC 2* values represent the reliability of group means [20]. Fleiss [34] gives the following interpretations: *ICC 2* < .40, bad; *ICC 2* from .40 to .75, appropriate to good; and *ICC 2* from .75 to 1.00, excellent agreement.

In order to evaluate the comparability of the two methods (*hypothesis 3*), the interrater agreement (IRA) between the self-ratings and observer ratings of two rating groups is of key interest. We computed unadjusted ICCs of the mean for the mean of each pair of ratings ($ICC_{unjust,mean}$) using IBM SPSS Statistics 25 [35] in order to test the absolute agreement between the two rating methods.

3. Results

In line with *hypothesis 1*, the current results suggest that there is significant agreement between workers with the same working activity for 96% of all items. There is no agreement for two items, one referring to “retreat possibilities” and the other referring to “varied postures”. On average, the agreement is good ($r_{wg,mean} = .42$). The second column of Table 1 presents the agreement values between ratings of the workers with the same activity.

In line with *hypothesis 2* on interrater reliability of self-ratings, the results indicate an excellent reliability value ($ICC 2 = .77$) and a medium effect size ($ICC 1 = .15$) across all items. For all but one item (“authority for those responsible”), the reliability values are above the critical threshold. A total of 29 items (61%) show excellent reliability; 18 items (38%) show appropriate reliability. *ICC 1* values vary across the different items ranging from small effects (e.g., a value of $ICC 1 = .02$ for “authority for those responsible”) to large effects (e.g., a value of $ICC 1 = .49$ for “fixed location”). In summary, 18 items (38%) show small effects, 21 items (44%) indicate medium effects, and nine items (19%) suggest large effects. The third and fourth columns of Table 1 present the interrater reliability values.

In individual assessment scores, there is considerable individual-level variability. In spite of that, the working

activity influences a substantial proportion of variance in the worker’s self-ratings, although it does not alone account for the variability. The results indicate that the work activity is a medium size predictor of individuals’ responses within psychosocial risk assessments. According to these results, single ratings of any worker are not a reliable source. However, the group averages are reliable measures. Moreover, the worker’s agreement demonstrates that the raters are “interchangeable,” indicating that the subjectivity bias is low and might be neglected.

Regarding *hypothesis 3* on agreement between the different methods, we report a good IRA ($ICC_{unjust,mean} = .71$) on average. For eleven activities (50%), the interrater agreement values are excellent, ranging from $ICC_{unjust,mean} = .77$ to $ICC_{unjust,mean} = .86$. For ten activities (45%), the IRA is good, ranging from $ICC_{unjust,mean} = .55$ to $ICC_{unjust,mean} = .75$. For one activity, the IRA value is below the critical threshold; those are “production, service, and stock” ($ICC_{unjust,mean} = .39$). Table 2 illustrates the agreement values between the two methods in its last column.

4. Discussion

In order to verify objective conceptualization and measurement of psychosocial working conditions, the agreement and reliability of self-ratings of psychosocial working conditions were identified. To judge the comparability of self-ratings and observer ratings in the context of psychosocial risk assessment, the agreement between the two methods was analysed.

Group means of workers’ self-ratings are reliable estimates with significant agreement. The average reliability was higher compared to meta-analyses on the interrater reliability (IRR) of job analysis [21, 22]. The item relating to “authority for those responsible” is the only item that is not assessed reliably at the group level. This may be because some activity groups consisted of workers from different hierarchical levels. Although employed managers were assessed as a separate group, group leaders or persons in comparable positions of authority were part of the workers’ ratings, leading to inconsistent results, because they may perceive the presence of authority differently from workers without any responsibilities for subordinates.

To conclude, the results strongly suggest the use of worker’s self-ratings, whereby results should be interpreted at group level. Besides that, good agreement was achieved by using condition-related items formulated in the first-person perspective. The agreement was higher than studies using a comparable design but items from the first person perspective in the self-ratings [18].

Since most of the currently available instruments use person-centred items with self-ratings in the first-person perspective, the current findings might be limited due to methodological differences in our item formulation. Future research might compare condition-related items with first- and third-person perspectives of the same instrument in order to further investigate the subjectivity bias in self-rating. However, we strongly suggest the general use of

TABLE 1: Agreement and reliability estimates of the self-ratings.

Psychosocial risk items	<i>Within-group agreement</i> r_{wg}	<i>Interrater reliability</i>			<i>F ratio</i>
		<i>ICC 1</i>	<i>ICC 2</i>		
<i>Work content</i>					
Task completeness	.43***	.05	.55	2.22**	
Task variety	.52***	.21	.88	8.11***	
Task significance	.63***	.21	.88	8.13***	
Influence on task content	.29**	.20	.87	7.46***	
Influence on task execution	.36**	.27	.91	10.93***	
Influence on work pace	.36**	.10	.74	3.80***	
Unambiguous work orders	.46***	.07	.67	3.08***	
Clearly assigned responsibilities	.54***	.05	.60	2.51***	
Authority for those responsible	.55***	.02	.36	1.6	
Skill utilization	.70***	.13	.79	4.86***	
Qualification opportunities	.20*	.14	.81	5.22***	
Advancement opportunities	.27*	.13	.78	4.62***	
No suppression of emotion	.34**	.09	.73	3.65***	
No critical life events	.44***	.30	.92	12.39***	
No aggression/violence	.61***	.31	.92	12.42***	
Fixed location	.46***	.49	.96	26.13***	
Job security	.30**	.05	.58	2.35***	
Work-life balance	.42***	.15	.83	5.12***	
<i>Work organisation</i>					
Compliance with working hours	.45***	.19	.86	7.21***	
Regular recovery breaks	.37**	.12	.78	4.483***	
No changes in working hours	.32**	.11	.76	4.15***	
Timely changes to working hours	.28**	.08	.66	2.96***	
Suitable ratio amount versus time	.37**	.10	.74	3.913***	
Time for core tasks	.43***	.08	.70	3.302***	
Uniform workload	.29**	.09	.73	3.74***	
No multiple tasks	.32**	.14	.81	5.19***	
No interruptions (from people)	.38***	.12	.78	4.61***	
No interruptions (due to ICT)	.35**	.22	.88	8.66***	
Comprehensive information	.54***	.03	.50	1.99**	
Availability of work equipment	.61***	.08	.69	3.242***	
<i>Social relations</i>					
Respect among colleagues	.65***	.08	.71	3.416***	
Support among colleagues	.63***	.10	.75	3.977***	
Professional conflict solving	.57***	.09	.71	3.467***	
Coordination of joint tasks	.59***	.08	.69	3.244***	
Helpful feedback from supervisor	.31**	.09	.73	3.724***	
Acknowledgement from supervisor	.24*	.16	.84	6.08***	
Respect from supervisor	.49***	.18	.85	6.671***	
Support from supervisor as needed	.37**	.09	.73	3.729***	
<i>Working environment</i>					
Sufficient Space	.36**	.14	.81	5.234***	
Contact opportunities	.54***	.07	.67	3.032***	
Retreat possibilities	.12	.12	.78	4.597***	
No unpleasant odours	.46**	.29	.91	11.73***	
Quiet working environment	.27*	.25	.90	9.849***	
Pleasant climate	.32**	.28	.91	11.12***	
Appropriate lighting	.40***	.20	.87	7.577***	
No hazardous/biological agents	.64***	.33	.93	13.92***	

TABLE 1: Continued.

<i>Within-group agreement</i>		<i>Interrater reliability</i>		
Psychosocial risk items	<i>r_{wg}</i>	<i>ICC 1</i>	<i>ICC 2</i>	<i>F ratio</i>
No heavy physical loads	.52***	.35	.94	15.54***
Varied postures	.14	.03	.43	1.75*
PsyHealth	.42	.15	.77	

Note. $N_{\text{activity groups}} = 22$; $N_{\text{mean}} = 27$; *** $p < .001$; ** $p < .05$; * $p < .01$; ICC: intraclass correlation; within-group agreement measured at the item level with r_{wg} .

condition-related items in research and practice as it resulted in comparable outcomes according to the present study, especially if the third-person perspective is used.

There was no within-group agreement between the workers' self-ratings for the items referring to "retreat possibilities" and "varied postures." One explanation might be that the working conditions are not the same for all people rating the same activity. For instance, some might have a single office and others an open-space office; some might be able to change their body posture frequently, while others may be required to remain at their desk except for during their lunch break. Both conditions are, however, very important to protect workers' mental and physiological health. Studies have already demonstrated that not only recovery from work stress during nonwork time is important to reduce mental and physiological strain [36] but also at-work recovery exercise can help to enhance concentration and is associated with less fatigue [37]. In relation to varied postures, there is evidence that interventions are able to reduce sedentary behaviour and increase physical activity [38]. Furthermore, interrupting the time spent sitting at the workplace might produce long-term reductions in blood pressure [39].

The comparison of workers' self-ratings and committee observer ratings shows that there is strong agreement between both methods. The agreement between the two methods is higher than what could have been expected from the results of studies with comparable instruments that demonstrated correlations around .53-.54 or lower [18, 25]. Based on our present results, we advise the use of fact-based and condition-related items in both versions for future research and practice. Intriguingly, according to our data, the workers' ratings did not always indicate fewer resources than the OSH committee (e.g., administrative work A in company A, medical-psychological work in company C, and childcare in company G). This additional finding underlines the advantage of fact-based items in relation to objectivity.

For one work activity conducted in production, service, and stock, the agreement between the two rating methods was not as high as for the other activities. One reason might be that the assessment of this activity differed from the assessment of the other activities in the way that the activity group was inhomogeneous, since it contained workers of three different areas of activity. For anonymity reasons, throughout the study, results of the psychosocial working conditions were only generated if at least ten workers rated one activity. Therefore, in company F, the working areas had to be aggregated. This practical issue of aggregation of work activities for the purpose of survey assessment is a problem that may often occur especially with small companies.

Based on our results, we cannot recommend aggregating inhomogeneous activities. A better solution might be to assess each activity separately using a different method than a survey. The other reason for low agreement between the two assessment methods in this specific work activity might be that the committee only consisted of two supervisors. The low number of evaluators and/or the lack of diversity in the committee might be additional reasons for the lower agreement. This conclusion is also drawn by other studies which recommend a higher number of experienced raters [22].

However, agreement values of other activity ratings were still good, although the committees were less diverse and consisted of only two evaluators (e.g., pharmaceutical work in company B). Also, activities that were inhomogeneous, but rated by a diverse committee, reached acceptable agreement values (e.g., service, kitchen, technology, and cleaning work in company C). Relating to our results, we are unable to determine conclusively whether homogeneity of activities or member number and diversity within committees are the more significant factors for agreement. Through systematic manipulation of the homogeneity of the activity being rated and the variety of the committee, future research might find out whether the inhomogeneous activity or the limited observer variety is more associated with disagreement. Furthermore, it would be interesting to know if observer trainings on psychosocial work demands (e.g., for executives) might further improve agreement [19].

It is important to consider that committee compositions varied considerably in our study, which might be a limitation of our study. In the end, we are not able to isolate single effects of different committee compositions. However, if anything, we see this as a strength of the study. For each activity, we have tried to find the best possible variant that fits the organisational conditions. We support this approach for the practical application of psychosocial risk assessments in the future. It allows a certain flexibility to adapt the procedure to the organisational conditions and thus increases user-friendliness and acceptance. Future research might focus on the agreement within different committee-rating compositions to derive a more accurate recommendation.

Other limitations of our study are that we relied only on companies in Germany and only companies took part, which already have a structured occupational health and safety system. We would like to further investigate the agreement in companies outside Germany and with other occupational health and safety structures. In addition, the fact that similar approaches may exist in other nations, but that we are not aware of, cannot be ruled out.

TABLE 2: Descriptive statistics for the different methods and interrater agreement (IRA).

Work activities companies A to K	N	Self-ratings		SD	N	Committee ratings Mean	SD	IRA ICC
		Mean	SD					
<i>Company A</i>								
Administrative work A	23	1.99	.56		9 (12)	1.46	.77	.75
Childcare	40	2.19	.54		10 (12)	2.48	.92	.77
Fire service	27	1.73	.55		7 (12)	1.94	.95	.72
Administrative work B	12	2.04	.58		4 (12)	2.47	.83	.77
Administrative work C	18	2.41	.52		3 (12)	2.52	.81	.86
<i>Company B</i>								
Pharmaceutical work	54	1.91	.51		2 (3,3)	2.34	.73	.71
<i>Company C</i>								
Medical-psychological work	10	2.10	.52		4 (3,3,4,6)	1.92	.64	.77
Service, kitchen, technology, cleaning work	12	1.98	.52		5 (3,3,3,4,6)	2.20	.60	.65
Administrative work	12	2.10	.61		3 (3,4,6)	2.12	.65	.80
<i>Company D</i>								
Sales work	26	2.12	.65		4 (4,7,7,11)	2.39	.59	.82
Production work	19	1.77	.56		5 (4,4,7,7,11)	1.75	.70	.84
Laboratory work	12	1.85	.75		4 (4,7,7,11)	2.24	.48	.67
Management work	22	2.20	.42		3 (4,7,11)	2.51	.38	.59
Administrative work	38	2.25	.47		2 (4,7)	2.05	.62	.55
<i>Company E</i>								
Law enforcement service	42	1.74	.44		6 (3,5,5,4,6,10)	2.07	.49	.72
<i>Company F</i>								
Development engineering/customer acquisition	17	2.24	.54		2 (3,11)	2.40	.65	.78
Production, service, stock	17	1.92	.55		2 (3,3)	2.58	.52	.39
<i>Company G</i>								
Childcare	22	2.38	.45		4 (3,3,4,7)	2.25	.73	.73
<i>Company H</i>								
Security surveillance	97	1.75	.52		6 (1,3,3,4,5,11)	1.59	.54	.81
<i>Company I</i>								
Physiotherapeutic work	13	2.15	.67		3 (2,4,6)	2.13	.66	.82
<i>Company J</i>								
Administrative work	20	2.00	.52		3 (4,5,7)	2.49	.57	.55
<i>Company K</i>								
Administrative work with citizen contact	45	2.07	.58		5 (1,3,4,4,5)	2.26	.62	.79
PsyHealth								.71

Note. N: number of raters; SD: Standard Deviation; IRA: interrater agreement; ICC: intraclass correlation, *unjust, mean*: 1: management representative, 2: staff council representative, 5: occupational safety officer, 6: occupational physician, 7: human resource representative, 8: occupational health manager, 9: equal opportunity commissioner, 10: representative of severely handicapped persons, 11: other/not applicable, 12: group assessment, 13: safety representative.

According to our study, results of self-ratings and observer ratings of psychosocial risk are comparable if certain aspects are taken into account in their implementation: In order to assess psychosocial working conditions independently from the individual, items should be formulated as condition-related and in the third-person perspective. Furthermore, homogeneous activities should be rated and the committee should consist of OSH specialists as well as workers' representatives.

5. Conclusion

As far as we know, this is the first study comparing self-ratings and observer ratings of an instrument for psychosocial risk assessment which consists of identical items and perspectives in both versions. The results have political and practical implications as they justify the application of both methods. Experts now have a scientific justification for the use of self-ratings and observer ratings in the management of occupational psychosocial risks. Moreover, our study shows that a psychological risk assessment with worker participation is possible for every type of company. For companies that are too small for a risk assessment based on large anonymous surveys and cannot afford comprehensive assessment by external professionals, the committee-rating method provides a reliable alternative for conducting psychosocial risk assessment. For all other companies, we advise a simultaneous assessment with self-ratings and observer ratings to emphasize objectivity of the findings. Of course, they could continue to rely exclusively on self-reports, but the involvement of workers, supervisors, and experts into this process might lead to a fairer treatment approach. By demonstrating comparability of self-ratings and observer ratings in psychosocial risk assessment, we hope to foster objective organisation-centred approaches.

Data Availability

The statistical data used to support the findings of this study have not been made available due to data protection of the participating companies and their employees. The study center will consider requests for data from researchers who meet the criteria for access to confidential data.

Disclosure

Isabell Schneider is now working at the German Social Accident Insurance Institution for the energy, textile, electrical and media products sector (BG ETEM). Funding did not influence the authors' decisions on (a) the study design, (b) data analysis and interpretation, (c) the writing of the manuscript, and (d) the submission of the paper for publication. Parts of the study results have been presented at two national conferences in Germany (DGAUM 2017, Hamburg; AOW 2017, Dresden) and at an international conference (APS, 2018) in San Francisco, USA.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Authors' Contributions

All three authors have read the submitted manuscript and the first author confirms that the requirements for authorship have been met by the two coauthors. Isabell Schneider is the author of the manuscript. Jessica Lang and Martin Mädler proofed previous versions of the manuscript. Martin Mädler has developed the software for this special purpose of online data collection. Jessica Lang supervised the conceptualization and study design. Isabell Schneider analysed the data and submitted the final manuscript.

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Research Article

Addressing Risks of Violence against Healthcare Staff in Emergency Departments: The Effects of Job Satisfaction and Attachment Style

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Violence in the workplace is one of the most serious issues affecting the healthcare sector. The incidence of violent behaviour towards healthcare workers is increasing worldwide. It is difficult to assess the extent of the problem, however, as violent incidents are underreported. In fact, many doctors and nurses see violence—perpetrated primarily by patients and visitors (friends and relatives of patients)—as a part of their job. Several studies indicate that violent behaviour against healthcare workers has serious consequences for the professionals involved, as well as for the wider healthcare system. The purpose of this study was to ascertain the prevalence of patient and visitor violence in a number of emergency departments in northeastern Italy and to explore the relationship between violence and certain psychosocial factors (adult attachment style, age, and job satisfaction). Data were collected using an online questionnaire. Our results demonstrate that patient and visitor violence in emergency departments is a serious risk for nurses and doctors and that it is affected by several factors relating to both patient pathologies and the way the workplace and work patterns are organised. Previous studies indicate that the most common form of violence experienced in these contexts is emotional violence and that nurses are more likely than doctors to suffer emotional and physical violence. Based on multiple regression analysis of the data, it appears that greater age and higher scores in secure attachment are associated with reduced experience of emotional violence from patients and visitors. Furthermore, our results show that the relationship between secure attachment and the amount of patient-and-visitor-perpetrated emotional violence experienced is mediated by levels of job satisfaction. We also discuss the potential implications of these results in terms of using staff training to prevent and manage patient and visitor violence and improve the safety of healthcare professionals.

1. Introduction

Recent years have seen an increase in the number of violent acts recorded around the world [1]. While representations of violence in leisure and entertainment settings, on the roads, in public spaces, and within the family are relatively common, the presence of violence in healthcare environments is an unfamiliar concept to many [2]. Unfortunately, data from the European Agency for Safety and Health at Work indicate that healthcare is actually the sector that experiences the highest rates of workplace violence [3–5]. Workplace violence can mean a single event or a number of small, recurrent incidents that, accumulatively, have the potential to cause

serious harm to the worker [6]. For healthcare workers, violence represents a complex and dangerous occupational hazard [7]. The primary purpose of any healthcare system is the promotion of health while ensuring equal opportunities [8]. Patients need a calm, stable environment in which they are supported and feel safe; a healthcare setting cannot be a “battlefield” [2]. Nonetheless, the incidence of violence in the healthcare system is on the rise [9] and, while this phenomenon has been explored in particular in relation to the nursing profession [10], there is a lack of research about violence affecting doctors [11]. Doctors play a key role in healthcare systems, so it is important to study the prevalence and nature of their exposure to workplace violence [12].

The terms “violence” and “aggression” are not easily distinguished from one another. For this reason, in our study, they are treated as synonymous [13]. Furthermore, many different instruments have been developed for assessing workplace violence [14], so it can be difficult to compare different studies [15]. Another problem is the lack of uniform definitions of workplace violence in the literature [14, 16]. World Health Organization (WHO) defines violence as the intentional use of threatened or actual force against a person or a group which may cause physical or psychological trauma [17]. The European Commission defines workplace violence as “all situations when a worker is offended, threatened, or attacked in conditions directly related to his/her job and when these situations directly or indirectly endanger his/her safety” [18, p. 113] or involve an explicit or implicit challenge to his/her well-being or health [6].

The literature suggests that the most common sources of violence against healthcare workers are patients and visitors [13]. There are three types of patient and visitor violence: emotional attack, physical violence, and sexual harassment [19]. The term “emotional attack” signifies psychological violence of a verbal, nonphysical nature. While the existence of physical violence in the workplace has always been recognised, the prevalence of psychological violence has long been underestimated and has only recently received due attention [6]. Emotional attacks include verbal abuse, in the form of harsh words, cursing, speaking in an aggressive manner, or a raised voice [18], bullying/mobbing, and written or verbal threats [6, 20] that do not lead to physical injury [1]. Although a single incident can suffice [6], psychological violence is often perpetrated through repeated behaviour of a type that, by in a single incident, may be relatively minor but that, cumulatively, can constitute a serious form of violence [6]. Physical violence can be defined as any form of attack that has a physical component [1, 21] and entails the use of physical force against another person [22]. Sexual harassment is any unwanted, unreciprocated, and unwelcome attention or behaviour of a sexual nature that a person finds offensive and causes that person to feel threatened, unsafe, uncomfortable, humiliated, or embarrassed [22–24].

Violence is significantly underreported in healthcare settings [25], especially in relation to nonphysical forms of violence [26]. The research has provided numerous explanations for the underreporting of violence [20]: feelings of guilt or shame [27], fear of being blamed by the aggressor and/or their family for the violent behaviour or accused of taking revenge [28], a lack of time and unwillingness to fill in forms [29], and concern about consequences [30]. Another reason for this underreporting might be the belief, among some healthcare workers, that they are expected to deal with violence as part of their job [26, 31] and that reporting patient violence conflicts with their duty of care [16]. In some cases, there is a belief that no action will be taken at management level [16, 28, 30].

Recent studies estimate that patient and visitor violence against healthcare workers has been increasing [32, 33], but the lack of systematic investigation [11], the variety of research design used, and the tendency to underreport [34] make it difficult to uncover the true prevalence of

violent incidents [35]. Patient and visitor violence towards healthcare workers is a widespread issue [13, 36–39] in both developed and developing countries [32, 40–45]. A recent Italian study [46] confirms the diffusion of patient and visitor violence against healthcare professionals. In another Italian study, the percentage of respondents reporting patient and visitor violence ranged from 48.6 to 65.9 [20]. Ramacciati and colleagues [47] find that in the twelve months prior to the date of data collection 76.0% of emergency nurses experienced verbal violence. A study on Italian hospital staff shows that 60.2% of workers experienced psychological violence; the most frequent type of verbal violence is insulting and shouting. Another result is that 31.5% of hospital staff members experienced physical violence; the most frequent type is pushing [25].

The causes and contributing factors that give rise to these forms of violence have a variety of personal and situational aspects [5, 48]. In the healthcare setting, patients and their visitors are often going through a difficult time [49]. The experience of illness and the processes they have to go through as a result cause fear and anxiety, and these need to be managed [2, 31]. In these conditions, patients and visitors are dependent on healthcare staff [18], and this relationship has a key role in the care process. Problematic interactions between healthcare workers and patients or visitors can increase the likelihood of violence [15]. Person-related factors include poor [10] and rude [15] communication, insufficient communication [31], miscommunication [38], misunderstandings [50], shortcomings in the way information is shared between practitioner and patient [2], lack of trust between doctors and patients [44, 51], unmet or unrealistic expectations on the part of patients and their families [19], dissatisfaction with the course of treatment and/or disagreement with the doctor [1], and poor patient compliance [9]. Important situational factors that contribute to patient and visitor violence include a combination of organisational [15, 17–19, 28, 32, 50] and the environmental conditions [9, 16, 28, 32, 49, 52]. Other factors include loss of respect for the doctor [53] and the perception of a poor standard of care [2, 44].

Many studies on patient and visitor violence recognise that, irrespective of cultural differences and disparate risk factors, the consequences of violence are similar [21]. Both direct and indirect exposure [54] to violence has immediate, extensive [32], and often long-term effects [22] on various levels [55]. Workplace violence is associated with a reduction in job satisfaction. The impact of doctor and nurse satisfaction on patient care has also been investigated: more satisfied healthcare workers have more satisfied patients [56, 57], and low doctor and nurse satisfaction is associated with higher attrition rates [58]. Job satisfaction is defined as the level of contentment a worker feels regarding his or her job [59]. Doctors, as a group, appear to be satisfied with their work, and some of the highest satisfaction scores have been seen in the area of patient relationships [60]. Patient and visitor violence is also associated with increased job stress [30, 35, 61]. When low job satisfaction, stress, and violence intersect at the workplace, as they often do, the negative effects accumulate rapidly and give rise to a vicious cycle, which is very difficult to untangle [22]. In addition to the

negative effects mentioned above, violence against healthcare staff can have a negative economic impact [62]. Workplace violence also has an impact on healthcare workers' careers and their ability to make decisions [32] and to carry out their day-to-day duties [12]. It also reduces their commitment to good care practice and undermines their confidence in their own professional capabilities [63] and leads to an increase in errors [32] and, in extreme cases, even malpractice [18]. It is possible that violent encounters contribute to a drop in the quality and efficiency of the entire healthcare system [12]. Another consequence of violent incidents relates to the individuals' attachment system, which is activated by signs of threat [64]. Attachment style has been thought to play a significant role in the healthcare worker-patient relationship [65]. Our attachment style affects both the way we perceive others in terms of threat and the way we perceive any type of interpersonal issue or problem [66]. We believe there is a gap in the literature regarding the way the attachment styles of healthcare workers affect their perceptions of patient and visitor violence.

The aim of our study was to determine the prevalence of violent behaviour in a number of emergency departments in hospitals in northeast Italy and investigate the relationship between violence and certain psychosocial factors, thereby providing a basis for appropriate intervention. Research in many countries, including Italy [20], indicates that workers in all sectors of healthcare are exposed to workplace violence [25] but that psychiatric [67] and emergency departments are the areas at greatest risk of patient and visitor violence [10], due to several factors that involve both patient pathology and the way services are organised and delivered [20]. Emergency departments are the areas that see the highest rates of patient or visitor violence [43, 54, 68]. The emergency ward is characteristically a high-pressure environment across the 24 hours of the day and experiences a high turnover of patients [37]. Patients and their visitors are often in a state of severe anxiety, stress, and fear and have to manage various forms of frustration and long waiting times, all factors that can increase the likelihood of violent behaviour [20]. This study focuses on the experience of healthcare staff (doctors and nurses) with regard to patient and visitor violence. Studies suggest that patients and their relatives or friends are the main perpetrators of violence in the healthcare workplace [21]. Most authors indicate that patients tend to be more violent than visitors [69–71]. However, other studies have suggested that patients' relatives and friends are more often responsible [30]. Therefore, we decided to investigate which types of violence tended to be perpetrated by patients and by visitors.

This study examines the type and frequency of violence experienced by healthcare staff (doctors and nurses). While most research on violence in healthcare workplaces has focused primarily on the experiences of nurses [5], the majority of participants in our study were doctors. For the purposes of the study, patient and visitor violence includes any form of emotional, physical, or sexual violence. Our analysis also investigates certain psychosocial factors, such as attachment style, job satisfaction, and age, as antecedents of emotional violence. It is hoped that this information

will be useful to healthcare staff and contribute to improving working practices and ongoing-training programmes.

H1. We assume that doctors perceive lower levels of patient and visitor violence than nurses.

H2. We assume that insecure (especially avoidant) healthcare workers perceive a greater level of violence in the actions and reactions of patients and visitors than secure ones.

H3. We assume that more satisfied healthcare workers perceive lower levels of patient and visitor violence.

H4. We explored the impact of attachment style, age, and job satisfaction on patient and visitor violence. We assume that secure and senior healthcare workers perceive lower levels of patient-and-visitor-perpetrated emotional violence; we also tested the mediating effect of job satisfaction.

2. Method

2.1. Ethics Statement. The data for this study were collected using an online questionnaire. Ethical approval for the study was guaranteed by the Ethics Committee at the researchers' institution. The questionnaires included a section that explained the nature and purpose of the study and a consent form. All respondents participated voluntarily and provided informed consent. Participants were informed that they could withdraw from the study or refuse to give information at any time without negative consequences of any sort. We preserved the privacy and anonymity of the doctors and nurses involved in the study. The email addresses used to distribute the questionnaires were provided by the managers of the emergency departments involved.

2.2. Subjects and Data Collection. Participants completed a questionnaire including measures of patient and visitor violence, attachment style, and job satisfaction. The questionnaires were completed in February 2019. Using email, we contacted 395 nurses and doctors who work in eight emergency departments in northeastern Italy. The research participants were selected on voluntary basis. A total of 149 questionnaires were completed (response rate of 37.73%). The gender distribution was 79 males (53.00%) and 69 females (46.30%); 1 participant did not indicate their gender (0.70%). The ages of the respondents ranged from 24 to 72 ($M = 46.84$; $SD = 11.36$; 2 missing data, 1.34%). The mean length of service was 18.47 years ($SD = 11.93$; range = 1–45; 1 missing data, 0.67%). The majority of the participants in this study were doctors (58.40%). A summary of the gender, age, and length-of-service data is reported in Table 1.

2.3. Measurement and Data Analysis. The questionnaire included questions on demographic and occupational characteristics, types of violence in the workplace perpetrated by

TABLE 1: Participants' characteristics ($N = 149$).

Variables	Whole Sample		Physicians		Nurses	
Gender						
Males	79	(53.0%)	50	(57.5%)	29	(46.8%)
Females	69	(46.3%)	37	(42.5%)	32	(51.6%)
Missing value	1	(0.7%)	0	(0%)	1	(1.6%)
Age						
24 to 30 years	11	(7.4%)	3	(3.4%)	8	(12.9%)
31 to 40 years	38	(25.5%)	26	(29.9%)	12	(19.4%)
41 to 50 years	43	(28.9%)	12	(13.8%)	31	(50%)
51 to 60 years	36	(24.2%)	26	(29.9%)	10	(16.1%)
Over 60 years	19	(12.8%)	19	(21.8%)	0	(0%)
Missing value	2	(1.3%)	1	(1.1%)	1	(1.6%)
Length of service						
1 to 10 years	51	(34.2%)	34	39.1%)	17	(27.4%)
11 to 20 years	24	(16.1%)	15	(17.2%)	9	(14.5%)
21 to 30 years	54	(36.2%)	23	(26.4%)	31	(50%)
31 to 40 years	19	(12.8%)	15	(17.2%)	4	(6.5%)
Missing value	1	(0.7%)	0	(0%)	1	(1.6%)

patients and visitors [72, 73], attachment style [74, 75], and job satisfaction [51, 76].

Types of Violence at Work. We evaluated three different types of violence (emotional, physical, and sexual) [72, 73]. We asked participants about their experiences of violence perpetrated by patients and visitors (patients' relatives or friends). Emotional violence includes verbal abuse, intimidation, obscene behaviour, threatening behaviour, threats, threats made over the telephone, threats to family, slander, and vexatious complaint. Physical violence encompasses property damage or theft, physical abuse, injury, and stalking. Sexual violence comprises inappropriate touching, sexual harassment, and sexual abuse. Responses were given on a 4-point Likert scale, ranging from 1 (*never*) to 4 (*always*). Cronbach's alphas were .883 (9 items, *emotional violence perpetrated by patients*), .699 (4 items, *physical violence perpetrated by patients*), .886 (9 items, *emotional violence perpetrated by visitors*), .754 (4 items, *physical violence perpetrated by visitors*), .928 (18 items, *emotional violence perpetrated by patients and visitors*), and .804 (8 items, *physical violence perpetrated by patients and visitors*). The alpha coefficients for the three items of *patient-perpetrated sexual violence* and the three items of *visitor-perpetrated sexual violence* were below acceptable levels, possibly due to poor interrelatedness between items or due to significant differences in content and type of sexual violence. Therefore, in order to measure *patient-perpetrated sexual violence* and *visitor-perpetrated sexual violence* we used two individual items: "inappropriate touching by patients" and "inappropriate touching by visitors."

Attachment style was evaluated using Adult Attachment Types [74, 75]. For each attachment type (avoidant, anxious, and secure) the participants indicated a level of agreement (or disagreement) with the description of how they typically felt in relationships: avoidant type: "I am some-what

uncomfortable being close to others; I find it difficult to trust them completely, difficult to allow myself to depend on them. I am nervous when anyone gets too close, and often, love partners want me to be more intimate than I feel comfortable being"; anxious type: "I find that others are reluctant to get as close as I would like. I often worry that my partner does not really love me or won't stay with me. I want to merge completely with another person, and this desire sometimes scares people away"; and secure type: "I find it relatively easy to get close to others and I am comfortable depending on them and having them depend on me. I do not often worry about being abandoned or about someone getting too close to me." Responses were given on a 4-point Likert scale, ranging from 1 (*completely disagree*) to 4 (*completely agree*).

Job Satisfaction. We used the 5-item *Global Job Satisfaction* scale from the Physician Worklife Survey [51, 76] (e.g., "Overall, I am pleased with my work"). Participants' responses were recorded on a 4-point Likert scale that ranged from 1 (*completely disagree*) to 4 (*completely agree*). Cronbach's alphas were .873.

Data analysis was performed using the SPSS statistical software package. First, for each variable, a composite score was computed by averaging the respective items. Pearson correlation was used to examine the association between variables. Using a paired sample *t*-test we analysed the differences between emotional and physical violence, emotional violence perpetrated by patients and emotional violence perpetrated by visitors, physical violence perpetrated by patients and physical violence perpetrated by visitors, and inappropriate touching by patients and inappropriate touching by visitors. To test whether male and female nurses and doctors reported different levels of perceived patient and visitor violence and job satisfaction independent, *t*-tests were applied. Finally, multiple linear regression analyses were conducted. The

regression models included attachment style, job satisfaction, and age as predictors and emotional violence as a dependent variable. We explored the impact of attachment style and age on patient-and-visitor-perpetrated emotional violence. We also tested the effect of job satisfaction as a mediating variable in the relationship between attachment style, age, and patient-and-visitor-perpetrated emotional violence, using the bootstrapping procedure [77]. In accordance with this procedure, three regression analyses were conducted. All regressions were carried out on 5,000 resamples. First, the mediator (job satisfaction) was regressed on the independent variables (anxious attachment, avoidant attachment, secure attachment, and age). Second, the dependent variable (patient-and-visitor-perpetrated emotional violence) was regressed on the independent variables; this second regression equation estimates the total effect of the independent variables on the dependent variables. Finally, the dependent variable was regressed simultaneously on both the mediator and the independent variables; this third regression equation estimates the direct effect. The indirect effect is calculated as the product of the regression coefficients obtained in the first and third regressions. It is significant if zero is not included in the confidence interval [78].

3. Results

3.1. Descriptive Statistics, Paired Sample, and Independent t-Test. The means and standard deviations of the research variables are presented in Table 2. There were differences in the type and frequency of violence experienced by healthcare staff and in the violence perpetrated by patients or by visitors (patients' relatives or friends). Nurses and doctors experienced emotional violence more frequently ($M = 1.86$, $SD = .55$) than physical violence ($M = 1.20$, $SD = .30$; $p < .001$). The results indicate that patients tend to be more violent than visitors: emotional violence is perpetrated more frequently by patients ($M = 1.97$, $SD = .60$) than by visitors ($M = 1.75$, $SD = .58$; $p < .001$); likewise, physical violence is perpetrated more frequently by patients ($M = 1.30$, $SD = .41$) than by visitors ($M = 1.10$, $SD = .24$; $p < .001$), and inappropriate touching is perpetrated more frequently by patients ($M = 1.26$, $SD = .58$) than by visitors ($M = 1.09$, $SD = .36$; $p < .005$). There were also differences between the professions in terms of exposure to patient and visitor violence (Table 3). Nurses reported higher risk of patient and visitor violence than doctors, with specific reference to patient-perpetrated emotional violence ($p < .001$), visitor-perpetrated emotional violence ($p < .001$), patient-and-visitor-perpetrated emotional violence ($p < .001$), patient-perpetrated physical violence ($p < .020$), patient-and-visitor-perpetrated physical violence ($p < .025$), inappropriate touching by patients ($p < .020$), and inappropriate touching by visitors ($p < .015$). We did not identify differences in relation to visitor-perpetrated physical violence. These results support our first hypothesis: doctors perceive lower levels of patient and visitor violence than nurses do. There were no significant gender differences in terms of exposure to patient and visitor violence.

3.2. Correlations. In line with our assumptions, the results (Table 2) reveal that avoidant attachment correlates positively with visitor-perpetrated emotional violence and patient-and-visitor-perpetrated emotional violence. Secure attachment, however, correlated negatively with visitor-perpetrated emotional violence, patient-and-visitor-perpetrated emotional violence, and patient-perpetrated physical violence. With regard to sexual violence, the correlations reveal that inappropriate touching by visitors correlated positively with both avoidant and anxious attachment. These results support our second hypothesis. Regarding the other relations between variables, the results indicate that patient-and-visitor-perpetrated emotional violence is negatively correlated with job satisfaction (these results support our third hypothesis) and with age. According to the literature, the perception of patient and visitor violence decreases as the healthcare worker's age increases.

3.3. Multiple Regression Analysis of Variables on Patient and Visitor Emotional Violence. Table 4 details the estimates and the 95% bias corrected confidence intervals. The results show that job satisfaction is negatively related to avoidant attachment and positively related to secure attachment. Regarding patient and visitor emotional violence, the results show that its relation with secure attachment and healthcare workers' age is negative. The overall effects of anxious and avoidant attachment were not significant. Regarding job satisfaction, the results indicate that it is negatively related with patient and visitor emotional violence. As for the indirect effects, the results show that job satisfaction mediates the effects of secure attachment; indeed, zero is not included in the confidence interval. Secure healthcare professionals experience lower levels of patient-and-visitor-perpetrated emotional violence, and this can be explained by their level of perceived job satisfaction. These results support our fourth hypothesis.

4. Discussion and Conclusions

The aim of our study was to explore the experience of violent acts in a number of emergency departments in Italian hospitals, offering an indication of the prevalence of patient-and-visitor-perpetrated violence and assessing the relationship between violence and psychosocial factors, with a view to providing a basis for appropriate intervention. The results of our study corroborate previous research and confirm existing evidence, also in Italy [20], that patient and visitor violence is a significant risk for healthcare workers. Our study reports different types of violence that healthcare workers experience on a regular basis. In accordance with previous studies, emotional violence is the most prevalent form experienced [5, 11, 43, 63], and patients are the main source of violence against healthcare staff [20, 70, 71].

In line with a number of studies [17, 32, 69], we confirm that there are no statistically significant differences between male and female workers in terms of exposure to patient and visitor violence. According to the literature [30, 47, 55], the age of the healthcare staff has an effect on their experience of

TABLE 2: Descriptive Statistics and Intercorrelations ($N = 149$).

		Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1	Emotional Violence by Patients	1.97	.60	-											
2	Emotional Violence by Visitors	1.75	.58	.733* **	-										
3	Emotional Violence by Patients and Visitors	1.86	.55	.934* **	.928* **	-									
4	Physical Violence by Patients	1.30	.41	.631* **	.517* **	.618* **	-								
5	Physical Violence by Visitors	1.10	.24	.520* **	.515* **	.556* **	.650* **	-							
6	Physical Violence by Patients and Visitors	1.20	.30	.645* **	.565* **	.651* **	.951* **	.852* **	-						
7	Inappropriate Touching by Patients	1.26	.58	.299* **	.285* **	.314* **	.344* **	.287* **	.353* **	-					
8	Inappropriate Touching by Visitors	1.09	.36	.358* **	.330* **	.370* **	.353* **	.166*	.310* **	.373* **	-				
9	Secure Attachment	2.45	.95	-.211* *	-.110	-.173*	-.173*	-.059	-.143	.036	-.086	-			
10	Avoidant Attachment	1.68	.74	.149	.213* *	.194*	.132	.018	.099	.126	.217* *	-.173*	-		
11	Anxious Attachment	1.41	.62	.094	.021	.062	.005	-.006	.001	-.067	.194*	-.132	.272* *	-	
12	Global Job Satisfaction	2.97	.75	-.188*	-.162*	-.188*	.015	.022	.019	.022	-.228* *	.229* **	-.218* *	-.156	-
13	Age	46.84	11.36	-.160	-.262* *	-.225* *	-.085	-.148	-.118	-.172*	-.089	-.078	-.097	.138	-.151

* $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

TABLE 3: Differences in the sample means ($N = 149$).

		Men	Women	t	Physicians	Nurses	t
1	Emotional Violence by Patients	1.90 (.58)	2.04 (.61)	1.41	1.76 (.51)	2.26 (.60)	5.47* * *
2	Emotional Violence by Visitors	1.66 (.56)	1.85 (.59)	2.01*	1.54 (.49)	2.03 (.57)	5.65* * *
3	Emotional Violence by Patients and Visitors	1.78 (.52)	1.94 (.57)	1.83	1.65 (.45)	2.15 (.55)	5.87* * *
4	Physical Violence by Patients	1.29 (.39)	1.31 (.43)	.30	1.23 (.41)	1.40 (.39)	2.44*
5	Physical Violence by Visitors	1.08 (.20)	1.12 (.28)	.94	1.07 (.24)	1.14 (.23)	1.58
6	Physical Violence by Patients and Visitors	1.19 (.26)	1.22 (.33)	.59	1.15 (.30)	1.27 (.27)	2.32*
7	Inappropriate Touching by Patients	1.22 (.57)	1.30 (.60)	.93	1.15 (.39)	1.40 (.76)	2.42*
8	Inappropriate Touching by Visitors	1.13 (.44)	1.06 (.24)	-.1.21	1.02 (.15)	1.19 (.51)	2.57*
9	Secure Attachment	2.43 (.98)	2.48 (.92)	.31	2.62 (.94)	2.21 (.91)	-2.66*
10	Avoidant Attachment	1.59 (.73)	1.77 (.73)	1.44	1.56 (.68)	1.85 (.79)	2.42*
11	Anxious Attachment	1.46 (.66)	1.35 (.56)	-.1.06	1.39 (.64)	1.44 (.59)	.44
12	Global Job Satisfaction	2.95 (.75)	3.00 (.75)	.41	3.01 (.74)	2.91 (.76)	-.80
13	Age	49.14 (11.69)	44.21 (10.53)	-2.66*	49.51 (12.15)	43.08 (8.96)	-3.69* * *

* $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

TABLE 4: Mediation effects of global job satisfaction on patients and visitors' emotional violence ($N = 149$).

	Global Job Satisfaction	Patients and Visitors' Emotional Violence			Indirect effect	Bias correct 95% confidence interval	
		β (SE)	β (SE)	β (SE)		Lower	Upper
1	Secure Attachment	.141* (.064)	-.099* (.047)	-.080 (.047)	-.019	-.192	-.003
2	Avoidant Attachment	-.192* (.085)	.098 (.062)	.073 (.062)	.026	-.034	.238
3	Anxious Attachment	-.081 (.101)	.023 (.074)	.012 (.073)	.011	-.141	.186
4	Age	-.010 (.005)	-.011* * (.004)	-.012* * (.004)	.001	-.018	-.004
5	Global Job Satisfaction			-.133* (.061)			
	R^2	.116	.109	.138			
	F	4.639* * *	4.333* * *	4.519* * *			
	df	4,142	4,142	5,141			

β = unstandardized coefficient; 5,000 resamples.

* $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

patient and visitor violence. Older respondents report experiencing less emotional violence than younger respondents do. It seems that older, and thus more experienced, healthcare workers acquire skills in patient and visitor management and communication and in deescalating confrontational situations. These enable them to defuse cases of verbal violence but may be less helpful in avoiding physical incidents [37, 44, 51, 63]. As expected, exposure to patient and visitor violence is also different among healthcare professions; the professionals at greatest risk of violence are nurses [10, 15, 26, 79] who are more likely to experience (emotional and physical) violence than doctors. This could be explained by many factors: the job of a nurse involves close personal contact with patients [1, 69] and a lot of time spent providing patient care [21, 55]. Furthermore, they often work alone, have access to drugs, and provide care to people in distress. Moreover, patients' perception that doctors have greater seniority than nurses may mean that the former are less likely to be threatened with emotional or physical violence than the latter [20].

We tested the effects of job satisfaction, attachment style, and age on patient and visitor emotional violence. Results of multiple regression analysis suggest an association between emotional violence and age and secure attachment: higher scores in secure attachment and greater age are associated with reduced experience of patient-and-visitor-perpetrated emotional violence. We also tested the function of job satisfaction as a mediating variable: results show that there is no mediating effect in the relationship between age and emotional violence; conversely, job satisfaction mediates the relationship between secure attachment and patient-and-visitor-perpetrated emotional violence. Our results confirm that the attachment style of a healthcare professional influences their perception of patient and visitor violence. According to the literature [66, 80], attachment style is an important variable that profoundly influences the way an individual perceives others and themselves in any type of threatening or violent interpersonal situation. Insecure attached individuals tend to be skeptical of apparent goodwill on the part of others and perceive any type of negative relational event or situation as more threatening than a secure attached person would. This perception is rooted in their thoughts and beliefs about themselves and other people and in the relational strategies they use in managing interpersonal closeness and/or distance. Moreover, secure attached healthcare professionals are more satisfied with their job [81, 82] and find more fulfilment than their insecure attached colleagues in the caring relationship with patients. In addition, insecure medical professionals, when asked to report their sources of well-being at work, cite fewer items in the relatedness area [83]. Insecure individuals, who perceive negative behaviour on the part of others as more threatening than secure people, may be inclined to attribute other people with hostile intentions [84, 85].

Our results support the conclusion that job satisfaction is the best predictor of patient-and-visitor-perpetrated emotional violence. Different researchers associate dissatisfaction among healthcare staff with an increased likelihood of violence. This is probably because of differences in the approach that dissatisfied doctors and nurses take to conflict, the

deleterious effect of their dissatisfaction on the practitioner-patient relationship [51], and the lower standards of care that they are able to provide [86]. When violence and low job satisfaction interact, their negative effects cumulate rapidly and give rise to a vicious cycle [22]. There is a close association between patient and visitor violence and low job satisfaction, but the direction of this relationship is not entirely clear [35], that is, whether violence causes a reduction in job satisfaction or if dissatisfaction among workers makes them more likely to be victims of violence. In accordance with findings reported in the literature [87, 88], our results suggest that doctors and nurses are at the greatest risk for violence when they are dissatisfied with their job and that the promotion of well-being at work and job satisfaction could effectively contribute to coping with, and preventing, patient and visitor violence [6].

For a variety of reasons, it is unlikely that violence in healthcare workplaces can be completely eliminated [28]. Prevention strategies and interventions are key to reducing future violence [50, 54]. Healthcare staff should therefore be trained to recognise and prevent violence and/or to manage violent situations adequately [68], because they are often not able to foresee a violent act and do not have any premonition of danger before being assaulted [20]. Moreover, training will help healthcare staff developing coping strategies [7, 32, 89] to identify, understand, and manage risk of patient and visitor violence. Our study confirms that emotional violence is the most frequent form of violence. As such, it is important to provide staff with training [9, 21, 90] to improve communication skills for calming patients and visitors [5, 19], adopt deescalation strategies [17], and develop capabilities in conflict resolution [10]. Our results also suggest that training interventions should be accompanied by efforts to improve job satisfaction. A second aspect to consider in preventing patient and visitor violence is the implementation of a safe practice environment [32, 54, 72]. Changes to the work environment and at an organisation level, for example, could include fixed emergency alarms and security guards [50], but there is also scope for improvements to occupational health and safety legislation and policy [17, 69]. Teamwork and a supportive workplace can further be helpful and effective in this regard [10, 20, 21].

We can list a number of limitations to our study. First, since our research was limited to a small number of emergency departments, we cannot generalise our findings to all Italian emergency departments. However, our results agree with the literature, and we have no evidence to suggest that the situation is different in other emergency departments. Second, our study used a cross-sectional research design. The selection of subjects therefore introduced an expected bias and no conclusions can be drawn as to the causality of the relationships between variables. A longitudinal study would be desirable at this point. Third, there is a relatively small number of healthcare workers that completed our questionnaire. The response rate (37.73%) represents a satisfactory outcome. We did not expect that every healthcare professional who received the questionnaire would complete it: workplace violence can be an embarrassing subject and difficult to report, and nurses and doctors are very busy. Fourth, the

study used a retrospective self-reporting approach for data collection. This method depends on the ability of the participants to recall events from the 12 months prior to collecting the data, which might be affected by recall bias. However, as most studies in the field of patient and visitor violence use a 12-month self-assessment time frame [15, 69], this procedure is important in enabling comparisons. Finally, the present study relied on self-reported measurements. However, to minimise problems, we used validated questionnaires that have been shown to have good reliability.

Future research should aim to investigate the relationship between patients' and visitors' perception of violence and healthcare staff's levels of job stress. According to Ferri and colleagues [20], in order to be able to suggest effective actions to prevent violence, future studies should explore collaboration practices and perceived social support among healthcare staff members. Additional research should focus on comparing different departments selected according to their differences in violent behaviour incidence.

Data Availability

The dataset used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. The authors report no conflicts of interest.

Authors' Contributions

All authors listed have made substantial, direct, and intellectual contribution to the work and approved it for publication.

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Research Article

To Approach or to Avoid? Motivation Differentially Mediates the Effect of Hardiness on Depressive Symptoms in Chinese Military Personnel

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Objective. To investigate the mediation effect of approach/avoidance motivation between hardiness and depressive symptoms. **Methods.** Cross-sectional design was utilized. Two independent samples of military servicemen (G1: military personnel in the Armed Forces; G2: Chinese army military cadets) ($n_1 = 98$, $n_2 = 140$) were sampled and investigated. The assessment tools of hardiness scale (DRS), behavioral activation and inhibition scales (BAS/BIS), and Center for Epidemiological Survey-Depression Scale (CES-D)/Beck Depression Inventory (BDI) were used. General linear model was conducted to examine the predictive role of hardiness (DRS) and motivation (BAS/BIS) on depressive symptoms (CES-D or BDI). The mediating role of BAS/BIS between hardiness and depressive symptoms was examined. **Results.** (1) Across army soldiers and military medical university cadets, hardiness ($\beta = -0.394$, $P < 0.001$) and behavioral inhibition ($\beta = 0.297$, $P < 0.001$) significantly predicted depressive symptoms. (2) For soldiers only, behavioral inhibition mediated the significant association between hardiness and depressive symptoms ($\beta = -0.043$, $SE = 0.027$, $95\% CI = -0.130 \sim -0.008$). (3) For cadets only, behavioral activation-Drive significantly predicted depressive symptoms ($\beta = -0.237$, $P = 0.012$), and hardiness operates through behavioral activation-Drive to influence depressive symptoms ($\beta = -0.057$, $SE = 0.036$, $95\% CI = -0.151 \sim -0.078$). **Conclusion.** Individuals who are low in hardiness and behavioral activation-Drive and who are high in behavioral inhibition showed more severe depressive symptoms. The relationship between hardiness and depressive symptoms was mediated by behavioral activation-Drive in cadets and behavioral inhibition in soldiers. The proposed model offers a useful approach for the development of hardiness training programs to alter approach/avoidance motivation in the military context. Future training program of hardiness could lay more emphasis on promotion of perseverance in pursuing goals in hardy individuals, which may in turn improve active coping.

1. Introduction

Conceptually, hardiness is deeply rooted in existentialism which emphasizes hardiness as commitment to challenges and motivation to cope with stressful circumstances to achieve meaning of life [1]. In the past few decades, an extensive body of researches on hardiness has been conducted in areas of clinical and military psychology [2]. Conceptually,

hardiness is an individual disposition or style that remains relatively stable across cultures and could be shaped under training conditions. The construct of hardiness was first proposed by Kobasa [3] and then defined by Maddi as the constellation of three intercorrelated dimensions (3Cs): *Commitment* (the positive attitude, belief, and behavioral tendency exhibited by individuals who could engage life and work with commitment rather than retreating into isolation),

Challenge (to see changes in life as challenges to grow and adjust effectively), and *Control* (to believe that they could exert control over the outcome) [4]. Across a range of occupational contexts and stressful conditions, converging evidence has indicated the buffering effect of hardiness against stress-related illness [3]. Greater level of psychological hardiness predicted adaptive immune and neuroendocrine responses to stress [5] and high level of happiness [6].

Military personnel are faced with stressful work situations including frequent deployments, family separation, life-threatening missions, and long work hours. Hardiness has received attention in military populations for its protective role against stress and maintains a healthy and stable state. For example, in military context which involved high levels of deployment-related stress, hardiness is found to be related to less depression and posttraumatic stress disorder (PTSD) [7]. An important reason why hardy people are more effective in stressful situations is their active coping strategies [8]. Earlier studies showed that adaptive coping (e.g., problem-focused, support-seeking) and maladaptive coping (e.g., avoidant coping) mediated the hardiness-illness relationship [9]. More use of positive coping strategies (e.g., active coping and planning) and less use of negative coping strategies (e.g., behavioral disengagement) were identified in those active service members and veterans with greater hardiness [10, 11]. Specifically, *Commitment* enhanced mental health by the use of emotion-focused coping strategies. *Control* improved mental health by the use of problem-focused and support-seeking strategies [12]. Persons low in hardiness are more likely to use avoidant coping such as substance/alcohol abuse [13, 14] on the one hand and benefit from social cohesion and report less mental health problems on the other hand [15].

However, further evidence suggested that coping mediates the relationships between dispositional motivation and psychopathological symptoms [16]. Reinforcement sensitivity theory (RST) defined two motivation systems: (1) behavioral activation system (BAS), which guides approach motivation towards reward, and (2) behavioral inhibition system (BIS), which directs avoidance motivation away from punishment [17]. Furthermore, dispositional motivation is a distal predictor of behavior, while coping strategies may be seen as the proximal predictor of behavior [18]. High BIS sensitivity predisposed the individuals to recruit more attentional resources for detection of potential failure to obtain reward [19] and to adopt more avoidant coping strategies [18]. In contrast, BAS sensitivity played a protective role in working against maladaptive avoidant coping (e.g., gambling and alcohol use) [20]. Depression is characteristic of reduced BAS [21–23] and increased BIS [23, 24], or the combination of both [25]. Presumably, a coping style based on weak motivation to seek reward (lower BAS) and strong motivation to avoid punishment (higher BIS) may lead to increased feelings of depression. Mediational study could provide more insights about the relationship between hardiness and mental health outcome. Therefore, we proposed that approach/avoidance motivation may act as mediators between hardiness and depressive symptoms, which has not been tested directly. The aim of the current study is to (1) confirm the predicting effects of hardiness and BAS/BIS on

depressive symptoms and (2) infer the mediating role of BAS/BIS between hardiness and depression symptoms.

2. Methods

2.1. Participants. To replicate the results within the relatively small sample, we conducted the investigation on another sample with similar age range. Therefore, two types of military personnel were investigated (G1: military personnel in the Armed Forces; G2: military medical university cadets).

G1. A group of military personnel in the Armed Forces were under survey ($n=101$; all male). The questionnaires with missing values ($n=3$) were excluded. Ninety-eight valid questionnaires were retained.

G2. A group of military medical university cadets were under survey ($n=142$; male: 137, female: 5). Those questionnaires with missing values ($n=2$) were excluded, with the remaining 140 valid questionnaires.

2.2. Measurements. The self-reported questionnaire included: (1) items on demographic and background variables, such as age, education, gender, and marital status, and (2) three measurement tools included DRS, BBS, CES-D (sample 1), or BDI (sample 2).

(1) *Dispositional Resilience Scale (DRS)*. DRS was originally developed by Paul Bartone [26] and was translated into Chinese version with satisfactory psychometric properties [27]. The DRS included 15 items and comprised of three dimensions (3Cs): Challenge, Commitment, and Control. The DRS was rated on a 4-point Likert scale ranging from 1 (not at all true) to 4 (completely true). The DRS has acceptable internal consistency (group 1: Cronbach alpha=0.607; group 2: Cronbach alpha=0.662). The 3-week test-retest reliability coefficient was 0.78 [26].

(2) *Behavioral Inhibition System and Behavioral Activation System Scale (BIS/BAS Scale, BBS)*. BBS was a reliable and valid instrument based on Gray's theory of reinforcement sensitivity [28]. The BBS was translated into Chinese and revised by Yanzhang Li [29]. The translated scale has 18 items and consists of 4 subscales: Behavioral Inhibition System (BIS) subscale (to measure avoidance motivation), Reward Responsiveness (RR), and Drive and the Fun Seeking (FS) subscale (to measure approach motivation). The RR, Drive, and FS subscales are comprised of behavioral activation system (BAS). The RR subscale measures the responsivity to current or anticipated positive stimuli. The Drive subscale measures the persistent pursuit of goals. The FS subscale measures the on-the-moment desire to obtain rewards or approach positive stimuli [28]. The scale uses a 4-point Likert scale ranging from "completely agree" to "completely disagree". The 2-month test-retest reliability was 0.59~0.69 [29]. The DRS has good internal consistency (group 1: Cronbach alpha=0.843; group 2: Cronbach alpha=0.833).

(3) *The Center for Epidemiological Survey-Depression Scale (CES-D)*. CES-D was developed by the National Institute of

Mental Health [30]. The CES-D aims to (1) screen for individuals with mild to severe depressive symptoms; (2) assess the severity of depressive symptoms in the past one week. The CES-D is comprised of 20 items which measure nine groups of depressive symptoms (*Sadness, Anhedonia, Loss of appetite, Sleep problems, Difficulty in thinking/concentration, Feelings of worthlessness, Fatigue, Agitation, and Suicidal ideation*) as defined by the DSM (Diagnostic and Statistical Manual) of APA (American Psychiatric Association). The CES-D is scored with a 4-point Likert scale ranging from 0 ("Not at all or less than one day") to 3 ("5-7 days"). The range of possible scores of CES-D is between 0 (for those who respond 0 to all 20 questions) and 60 (for those who respond 3 to all 20 questions). People who have a total score of ≥ 16 but do not meet clinical criteria for major depressive episode are deemed as having possible/probable major depressive episode [30]. The CES-D has good internal consistency in the army soldiers (group 1: Cronbach alpha=0.763).

(4) *Beck Depression Inventory-II (BDI-II)* Developed by Beck in 1967. Similar to CES-D, it can be used to screen depression as well as for the assessment of the severity of depression in patients. It measures three components of depressive symptoms: (1) negative attitude or negative emotions such as pessimism and helplessness; (2) physical symptoms such as fatigue and sleep problems; (3) difficulties in operation with the feeling that work is more difficult than before. The BDI is scored with a four-point Likert scale ranging from 0 (never/rare) to 3 (very often), with total scores indicating the severity of depressive symptoms (0~13: no depression, 14~19: mild depression, 20~28: moderate depression, and 29~63: severe depression). The BDI-II has good internal consistency in the military medical university cadets (group 2: Cronbach alpha=0.913).

2.3. *Procedure.* All procedures were approved by Ethics Committee of Army Medical University (Chongqing, China). A group of military personnel in the Armed Forces (sample 1) and military medical university cadets (sample 2) were administered with paper and pencil questionnaires which assessed hardiness, approach/avoidance motivation and depressive symptoms. Before the test, seven undergraduate investigators were trained to become familiar with the test procedures, instructions and measurement tools. Verbal informed consent of all participants (sample 1) was obtained during July to August in 2015. Written informed consent of all participants (sample 2) was obtained during October of 2016 to May of 2017. Different informed consent forms and depression scales were utilized because two studies were conducted independently during 2015~2017. However, the documentation of the consent process including the names of all participants, information provided, and date consent obtained was kept in the study record. Participants completed the questionnaires in the classroom (sample 1) and laboratories (sample 2) with the same procedures and instructions, under the guidance of one investigator for each participant. This procedure may preclude the possibilities that the measures could be affected by the test condition.

Furthermore, the use of two independent samples may allow us to draw robust conclusions about the effects found.

2.4. Statistical Analysis. Statistical Package for the Social Sciences version 22.0 (SPSS Inc., Chicago, IL) was used as the statistical software. General linear regression analyses were conducted with hardiness as independent variable, BAS, and BIS as mediating variables and depressive symptom (CES-D or BDI scores) as dependent variable. The predictive effect of independent variables (DRS, BAS, and BIS) on depressive symptoms (CES-D or BDI) was tested. PROCESS macro for SPSS [31] (model 4) were used, with hardiness as independent variable, BAS and BIS as mediating variables, and depressive symptoms (CES-D or BDI scores) as dependent variables. The bootstrap sampling method was adopted (resample size=1000) with 95% confidence interval to compute the indirect effect of BAS/BIS. The default setup of bootstrap sampling in SPSS macro PROCESS is 1000, which is sufficient for preliminary analyses. The results of mediation analysis were robust when 5000 sampling was utilized, which is the recommended number of sampling for final reporting (Preacher et al., 2008). These variables (hardiness, BAS/BIS, CES-D/BDI) were z-transformed and entered simultaneously into the regression analyses.

Then in order to verify the repeatability of the above results, the two data sets were combined. For convenience of direct comparison, the depressive symptom of the combined data set included standard score of the CES-D or BDI. The scores of other scales (including hardiness, BAS and BIS) are standardized. And then the above analyses were repeated on the assumption that the tested variables conform to the normal distribution.

3. Results

Descriptive statistics were listed below for army soldiers (sample 1) and military medical university cadets (sample 2). Between-group comparison of hardiness and motivation revealed that cadets had greater levels of hardiness and behavioral activation/inhibition than soldiers (Table 1). Specifically, greater commitment was shown in cadets than soldiers ($t=-0.28, P=0.006$), while challenge and control levels were comparable between groups ($t=-0.83, P=0.41$; $t=1.08, P=0.28$).

The inferential statistical analyses (i.e., general linear regression and mediating analyses) were performed on the combined sample and then were repeated for sample 1 and 2, respectively. We explored the mediating role of subfactors of behavioral activation (Reward Responsiveness, Drive, and Fun Seeking), which were entered as mediators between hardiness and depressive symptoms. (1) For soldiers, behavioral inhibition was positively related to depressive symptoms ($\beta=0.261, P=0.029$), while hardiness negatively predict the depressive symptoms ($\beta=-0.386, P<0.001$). Behavioral inhibition ($\beta=-0.043, SE=0.027, 95\%CI=-0.130~-0.008$) mediated the significant association between hardiness and depressive symptoms. (2) For cadets, behavioral inhibition was positively related to depressive symptoms ($\beta=0.350, P<0.001$), while hardiness and behavioral

TABLE 1: The hardiness personality, avoidance motivation, and depressive symptoms of the military community.

	Soldiers (M±S.D.)	Cadets (M±S.D.)	t (P)
Age	15~30 ^a	21.30 ± 1.89	--
Gender (male/female)	98/0	135/5	--
Education (middle school/high school/junior college/university)	26/64/7/1	0/0/0/140	--
DRS	41.58±5.81	43.20±4.05	-2.38*
BAS-drive	11.33±2.27	12.40±1.84	-3.85* **
BAS-reward responsiveness	12.35±2.04	13.32±1.62	-4.07* **
BAS-fun seeking	13.72±2.69	15.03±1.98	-4.08* **
BIS	13.50±3.25	18.74±2.95	-12.91* **
Z_CES-D/Z_BDI	-0.0007±1.01	0.004±1.00	-0.04

Note: * $P<0.05$, ** $P<0.01$, and * * $P<0.001$. ^a The age range (1=15~20 years; 2=21~25 years; 3=26~30 years; 4=31~35 years; 5=36 years and above) was collected. DRS=Dispositional Resilience Scale; BAS=Behavioral Activation Scale; BIS=Behavioral Inhibition Scale; Z_CES-D=Z value of CES-D (Center for Epidemiological Survey Depression Scale) total score; Z_BDI=Z value of BDI (Beck Depression Inventory) total score.

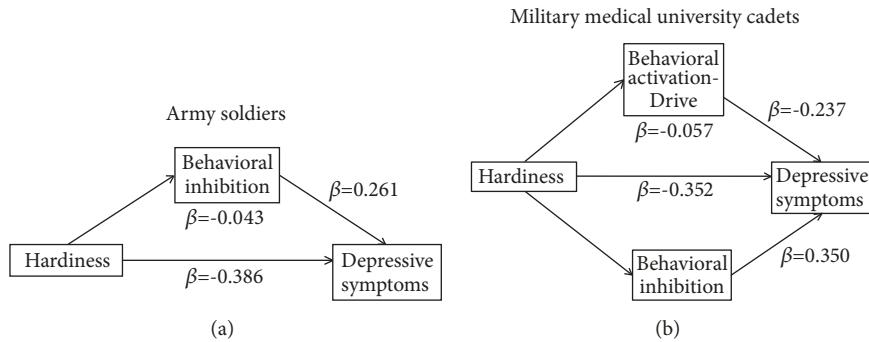


FIGURE 1: The mediating role of motivation between hardiness and depressive symptoms in military personnel.

activation-Drive negatively predict the depressive symptoms ($\beta=-0.352$, $P<0.001$; $\beta=-0.237$, $P=0.012$). Behavioral activation-Drive ($\beta=-0.057$, SE=0.036, 95%CI=−0.151~−0.078) mediated the significant association between hardiness and depressive symptoms. (3) Across both groups, hardiness negatively predicted depression symptoms ($\beta=-0.394$, $P<0.001$), and behavioral inhibition positively predicted depressive symptoms ($\beta=0.297$, $P<0.001$) (Figure 1).

4. Discussions

The military occupation involves high risk, danger, and heavy workload. Hardiness prepares the personnel to cope actively and be resilient to military stress. The current study revealed that cadets had greater levels of hardiness and behavioral activation/inhibition than soldiers. Specifically, commitment was higher in cadets than soldiers. Furthermore, this study demonstrated that, (1) across both army soldiers and military medical university cadets, hardiness and behavioral inhibition significantly predicted depressive symptoms; (2) for soldiers only, behavioral inhibition mediated the significant association between hardiness and depressive symptoms; (3) for cadets only, behavioral activation-Drive significantly predicted depressive symptoms, and hardiness operates through

behavioral activation-Drive to influence depressive symptoms.

4.1. Group Comparison of Hardiness and Behavioral Activation/Inhibition. Hardiness is a generalized style of functioning that includes cognitive, emotional, and behavioral features. Therefore, high hardy individuals tend to evaluate stress as challenge rather than threat. This adaptive cognitive style of hardy individuals manifested as cognitive flexibility during conscious and automatic emotion-regulatory processes [32]. The current study observed greater levels of hardiness in cadets which may enable these individuals to be more resilient to potentially threatening experiences and reduce the risk of or maintenance of depressive symptoms. However, the depressive symptoms of cadets were comparable to army soldiers which could be explained with the differentiated mediating role of motivation (e.g., behavioral activation/inhibition) of both groups. For example, for those who with greater hardiness, commitment to specific values and goals may enable the individuals to be actively engaged in life/work. The behavioral activation may lead to increasing rewarding experience which in turn helps alleviate the depressive symptoms [33]. Additionally, the sense of control in hardy individuals may help them realize the contingency

between effort and reward, which makes these individuals tend to increase their efforts in the short term and increase the compensatory approach motivation to overcome the frustration associated with the sense of loss of control in the long term [34]. However, for those who with less hardiness, avoidance motivation as mediator may act as adaptive coping to alleviate the detrimental effect of aversive environment stimuli and decrease the risk of depressive symptoms.

4.2. Mediation Model between Hardiness and Depressive Symptoms. First, this study confirmed the mediating rather than predictive role of approach motivation on depressive symptoms in military personnel. The approach motivation has an effect on depressive symptoms with group specificity. For the sample of military medical university cadets rather than army soldiers, behavioral activation-Drive mediated the relationship between hardiness and depressive symptoms. Sensitivity to rewards (BAS) (esp. Fun Seeking and Reward Responsiveness) plays an important role in cognitive processing (e.g., updating and working memory maintenance) of potential reward stimuli [19]. Furthermore, individuals with greater behavioral activation-Drive exhibit stronger motivation to pursue goals, regardless of whether these goals are inherently pleasurable [28]. This may enhance the opportunities to response-contingent positive reinforcement and lead to positive affect and wellbeing [35]. This result may help explain why hardiness could be enhanced through systematic training by choosing controllable goals and effective skills to deal with challenges [36, 37]. Therefore, the role of behavioral activation, especially the persistent pursuit of goals, should be emphasized during hardiness training of army soldiers. However, stronger trait avoidance motivation is also associated with increased risk of onset and chronicity of depressive disorders [24], which suggested the significance of inflexible coping strategies in less hardy individuals.

Second, this study found that the avoidance motivation mediated the relationship between hardiness and depressive symptoms in army soldiers, while positively predicted depressive symptoms in military medical cadets. Moderate level of sensitivity to punishment (BIS) may predispose the depressed individuals to negative attention bias towards negative stimuli and greater approach behavior towards disliked activities [19, 38]. In contrast, individuals with greater avoidance motivation may be more directly related to experience negative affect [35], negative cognitive/physiological reactivity [39], and depressive symptoms [40]. Meanwhile, BAS sensitivity (Drive) may work against the protective role of hardiness towards depressive symptoms. Therefore, the reduction of avoidance motivation is also an important target for evidence-based Behavioral Activation Treatment of Depression (BATD), which helps the depressed military personnel to set goals of personal value and surmount obstacles and finally to experience personal rewards after goal-attainment [41, 42]. Accordingly, training programs to increase hardiness and decrease avoidance motivation

in high-stress occupations such as the military are surely needed.

Limitations. The results of the present study suggest that hardiness is an important variable contributing to depressive symptoms of soldiers and military medical cadets, with avoidance motivation as potential mediating factor. One major limitation is the cross-sectional nature of this study. Participants answered questions regarding hardiness, motivation, and depressive symptoms at the same time, which may inflate the correlations between these variables. Therefore, longitudinal study is needed to verify the main findings of this study. Although these results are suggestive regarding the underlying mediating processes through which hardiness affects depressive symptoms, the robustness of the observed relationships between hardiness, motivation, and depressive symptoms was evidenced in at least two types of regression (linear; logistic). Nonetheless, replication of these findings in separate demographically similar samples (such as Army Reserve Medical Unit and Special Forces) and higher stress situations is needed for generalization of the results. Another limitation of the study is the relatively modest sample size, although it met the standard of mediation test proposed by Fristz and MacKinnon [43]. However, future study with larger sample size is combined with advanced statistical models including stress variables to examine the stress-resilience assumption.

Data Availability

The data studied is available from the authors upon request.

Conflicts of Interest

We declare no conflicts of interest.

Authors' Contributions

Linkun Zhai, Ruicheng Wu, Tianhao Huang, Renqiang He, Yang Xiao, Yang Yu, and Xiangji Kong collected the data; Xiaoxia Wang and Linkun Zhai designed the research; Xiaoxia Wang analyzed the data and wrote the manuscript; Janet Yuen-Ha Wong provided helpful critical advice on the manuscript; Xiaoyan Zhou and Hui Yang made substantial contributions to the research design and draft of the manuscript.

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Research Article

Burnout, Perceived Efficacy, and Job Satisfaction: Perception of the Educational Context in High School Teachers

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Burnout is closely related to personal and contextual variables, especially job satisfaction and commitment, and other less studied psychological variables, such as perception of teaching efficacy or educational context. *Objective.* The general objective of this study was to examine the relationships of burnout with perceived educational context, perceived teaching efficacy (personal and collective), and job satisfaction and commitment. *Materials and Methods.* A battery of instruments was administered to 500 high school teachers at different schools in several Italian provinces. *Results.* The cluster analysis found that one-third of high school teachers had high burnout. Evidence was also found associating elevated burnout with low scores in perceived efficacy (personal and collective), low job satisfaction, and low professional commitment. Furthermore, perception of the educational context is less positive when the teachers experience high levels of burnout. Finally, the results showed the mediating effect of perceived personal efficacy on the relationship between burnout and job satisfaction. *Conclusions.* The results are discussed from the perspective of developing teaching autonomy on improving personal efficacy, decreasing burnout, and increasing job satisfaction in an educational system which reinforces individual and collective competence.

1. Introduction

The burnout syndrome is characterized by dealing with a range of symptoms related to psychophysical exhaustion, impaired relations, and professional inefficacy and with disillusion [1–3]. Some authors have shown that problematic behavior of students and dealing with their families are two main factors affecting job stress in teachers [4, 5]. At least 30% of teachers have experienced burnout in the last two decades with similar incidence in different countries, which has been accompanied by negative consequences to health, economic level, and degree of commitment and satisfaction in the teaching profession [6]. In this study, one of our objectives was to find homogeneous groups of teachers by burnout level. Then we analyzed the state of burnout in the high school context and its relationship with perceived educational context, teaching efficacy, job satisfaction, and commitment.

In the literature on the burnout syndrome, there is evidence of a significant relationship between burnout and perceived educational context [7–9]. The conclusions of the study by Khani and Mirzaee [7], for example, showed that contextual variables could not only cause burnout in teachers directly but also influence it indirectly by increasing the effect of different stressors. Similarly, research by Klusmann et al. [8], with a large sample of high school teachers from over one hundred German schools, revealed that when the analysis controlled for individual teacher characteristics, disciplinary problems in the classroom predicted a higher level of emotional exhaustion. In this vein, problems of coexistence such as fighting and problems with the teaching staff were also the aspects of most concern to the families in different European countries [10]. Emotional exhaustion is associated with higher levels of nonphysical violence [11]. In another line, research by Skaalvik and Skaalvik [12] with Norwegian teachers showed

that emotional exhaustion was related more strongly to pressures of time, while depersonalization and the reduced personal accomplishment were associated more intensely with parent-teacher relationships. Meanwhile, in a study by Hultell and Gustavsson [9], work demands (unsatisfied expectations, work load, the role of stress, routinization, social isolation, and passive coping strategy) were more closely related to burnout than work resources (autonomy, social support from colleagues, social support from supervisor or principal, satisfaction with salaries, mastery of skills, and active coping strategies) which were more connected to job commitment. García-Arroyo and Osca [13] suggested that burnout coping strategies should be based on nonlinear interactive models, since coping operates in a combined process in which some strategies affect others.

Interest in studying the relationship of burnout and teaching efficacy has been growing with time [14]. However, because teaching efficacy has been conceptualized and measured in different ways in different studies, some authors have preferred to differentiate between personal and collective efficacy [15–19]. Personal efficacy refers to confidence in one's own actions to reach expected results [15] and collective efficacy is defined rather as the belief in the ability of the school or team of teachers to perform actions leading to achievement of goals [17–19].

With regard to self-efficacy or personal efficacy and burnout, the empirical literature reflects a significant negative relationship between the two variables [20–24]. Thus Briones et al. [20] found that self-efficacy of teachers was a direct predictor of personal accomplishment, as well as perception of support received from colleagues. In this same direction, Evers et al. [21] found that beliefs of self-efficacy were related significantly and positively to personal accomplishment and, furthermore, had a significant negative relationship with the emotional exhaustion and depersonalization dimensions. Ventura et al. [24] found that employees with more self-efficacy at work perceived more challenging demands and fewer impediments, and this in turn was related to stronger commitment and less burnout. Similarly, in healthcare, Molero et al. [23] found that self-efficacy and stress management protected from burnout. In this area, it was the emotional intelligence dimension of adaptability which was the strongest predictor of self-efficacy [25]. Higher levels of self-esteem have also been linked to lower levels of burnout [26]. However, less research has been done on the relationship between collective self-efficacy and burnout and there are no significant results. For example, in the study by Malinen and Savolainen [22] with a sample of Finnish high school teachers, collective efficacy concerning how discipline was maintained among students did not explain burnout.

There is plentiful precedent literature supporting the assumption that job dissatisfaction and burnout maintain a close relationship with each other [27–29]. Thus in the study by Skaalvik and Skaalvik [12], teachers' job dissatisfaction was directly related to emotional exhaustion and diminished personal accomplishment. On the contrary, greater teacher job satisfaction at different grade levels was related to satisfaction of the psychological needs for autonomy, teaching staff competence, and relations [24], with self-determined

motivation [24, 30], with cognitive self-regulation [31], and with stronger social support [32]. Furthermore, job satisfaction has been found empirically to have a positive role in subjective wellbeing [33, 34] and teacher self-concept [35].

The perception of the educational context also has an important role in job satisfaction [7, 12, 35]. Job satisfaction has been found to be indirectly related to all the aspects of the school context (support from supervision, pressure of time, relationships with parents, and autonomy), through emotional exhaustion and reduction in personal accomplishment [12]. Other studies have related job satisfaction, burnout, and teaching efficacy. For example, Skaalvik and Skaalvik [36] found that teacher self-efficacy and the two dimensions of teacher burnout (emotional exhaustion and depersonalization) were significantly associated with teacher job satisfaction. Briones et al. [20] demonstrated that teacher self-efficacy was an indirect predictor of job satisfaction.

With respect to the relationship between job satisfaction and collective efficacy, several different studies have found that collective efficacy is not correlated with teacher job satisfaction [22, 36]. Since the role of efficacy in job satisfaction and burnout is a line of research where the most studies, at least in education, have been suggested, another of our major objectives was to analyze the mediating role of teaching efficacy in the relationship between burnout and job satisfaction.

In addition, with respect to the relationship between burnout, commitment, and educational context, job commitment seems to modulate the relationship between demands and burnout and between resources (personal and related to the job) and burnout [37]. Meanwhile, Pérez-Fuentes, Molero, Gázquez, and Oropesa [38], with a large sample of healthcare professionals, found that the interpersonal dimension of emotional intelligence was the strongest predictor of job commitment. Likewise, commitment was found to be positively associated with self-efficacy and negatively with burnout [39].

After analyzing the most relevant findings of previous studies on burnout in the high school context and its relationship with different contextual and personal variables, the main objectives and hypotheses of this study are discussed below. As mentioned a few paragraphs above, one of the purposes of this study was to find homogeneous groups of teachers by their level of burnout. It was also intended to examine the relationships of burnout with both perception of the educational context, perceived teaching efficacy (personal and collective), and job satisfaction and commitment. In this sense, we also wanted to find any significant differences between the high and low burnout groups based on the variables above. Finally, we attempted to take a further step forward by exploring the mediating role of perceived teaching efficacy on the relationship between burnout and job satisfaction.

2. Materials and Methods

2.1. Participants. The study sample consisted of 500 7th and 8th grade high school teachers, selected at random

TABLE 1: Distribution of the sample by sociodemographic and professional variables.

	n	%
Sex		
Male	164	32.8
Female	336	67.2
Age		
From 25 to 35 years	49	9.8
From 36 to 45 years	136	27.2
From 46 to 55 years	202	40.4
Over 55 years	113	22.6
Education		
Diploma	12	2.4
Undergraduate degree	421	84.2
Master's degree	65	13.0
Ph.D.	2	0.4
Years of experience		
5 years or less	61	12.2
From 6 to 10 years	71	14.2
From 11 to 20 years	169	33.8
From 21 to 30 years	125	25.0
Over 30	74	14.8
Type of contract		
Permanent	362	72.4
Temporary	138	27.6
Teaching high school		
7th grade	244	48.8
8th grade	256	51.2

from different schools in the Sicilian provinces of Trapani, Agrigento, and Palermo (Italy). Of this sample, 67.2% ($n=336$) were women and 32.8% ($n=164$) were men. The most representative group of 40.4% were teachers aged 46 to 55 ($n=202$), followed by the group from 36 to 45 years who made up 27.2% ($n=136$) of the sample, those who were over 55 comprised 22.6% ($n=113$), and finally, the least representative group of 9.8% of the sample were the youngest, from 25 to 35 years. By level of education, 84.2% ($n=421$) had undergraduate degrees, 13% ($n=65$) had Master's degrees, 2.4% ($n=12$) had diplomas, and 0.4% ($n=2$) had Ph.D. degrees (Table 1).

Concerning their professional characteristics, the groups of teachers with seniority (years of experience) of 11 to 20 years and from 21 to 30 years made up 33.8% ($n=169$) and 25% ($n=125$) of the sample, respectively. By type of contract, 73.4% ($n=362$) had a permanent contract and 27.6% ($n=138$) temporary. Finally, although all the teachers in the sample taught high school, 48.8% ($n=244$) taught seventh grade and 51.2% ($n=256$) eighth grade.

2.2. Instruments

2.2.1. LBQ: Link Burnout Questionnaire [3]. This is a self-report questionnaire which provides new burnout indicators for those who work in service professions. Santinello [3] reviewed the three dimensions studied by the MBI and added

the new disillusion scale to enlarge the theoretical tradition of burnout.

The four dimensions examined by the LBQ are (1) psychophysical exhaustion, (2) impaired relations, (3) professional inefficacy, and (4) disillusion. Disillusion is manifested by loss of passion and enthusiasm for daily activities. Burnout may therefore be characterized as the final state in a long process of disillusion.

The LBQ consists of 24 items with a six-point Likert-type response scale for study of four dimensions, each with three positive and three negative elements: the psychophysical dimension (energy-exhaustion), relationships (involvement-deterioration), professional competence (efficacy-inefficacy), and existential expectations (satisfaction-disillusion). The internal consistency of the scales, according to data found by the author, varies from .68 (professional inefficacy) to .85 (disillusion). In our case, the Cronbach's alpha for the complete questionnaire was .89 and for each one of the scales it was psychophysical exhaustion ($\alpha=.70$), impaired relations ($\alpha=.66$), professional inefficacy ($\alpha=.65$), and disillusion ($\alpha=.82$).

2.2.2. Assessment Questionnaire for Convictions about Efficacy, Perceived Context, Job Attitudes, and Satisfaction in School Contexts [19]. This questionnaire is comprised of several scales with a seven-point Likert response scale: perceived

personal efficacy scale (the teacher's conviction of being up to the demands of their role and coping with any emergency or eventuality, for example, with regard to families or their colleagues, in managing the class or problem students) and perceived collective efficacy scale (the teacher's beliefs with regard to the ability of the school to dominate complicated tasks and cope with innumerable critical situations, approach problems related to school quitting, manage relations with local authorities, and face the demands of school autonomy).

Job satisfaction is the degree of satisfaction with the role, possibilities for personal growth, and work environment and the degree to which personal needs are satisfied by the job.

Job commitment is bond which the person establishes with the organization and their commitment to achieve objectives.

Scales concerning the perceived educational context are the principal perception scale (degree to which the teachers evaluate the principal's ability to identify resources within the school, promote cooperation, and set clear objectives), colleague perception scale (perception of job relations, work of fellow teachers, and efficacy of communication among colleagues), student perception scale (perception of student-teacher relations, students' interest in the subjects taught, and respect for the setting and persons), family perception scale (perception of parent-teacher relations, degree of parent participation, and interest in their children's school life), technical-auxiliary staff scale (perception of how technical-auxiliary staff works in terms of competence and flexibility), physical environment perception scale (evaluation of the school's facilities, adequacy for the educational demands, and general safety). Its reliability was calculated using the Cronbach's alpha coefficient, which varied from .90 (job satisfaction) to .95 (perception of the school principle), and a value of .98 for the complete questionnaire.

2.3. Procedure. After consent was received from the direction of the participating schools, a meeting was held with the teachers where the study was presented, explaining its importance and clarifying its objectives, to acquire the approval and participation of all the teachers. The questionnaire was given directly to each teacher for completion at will. Participation in the study was voluntary and anonymity of participants was guaranteed. A period of one to two weeks was set for compilation of the data. It was administered at the schools in the middle of the school year. The SPSS version .23 for Windows was used for data processing and analysis.

2.3.1. Data Analysis. First, bivariate correlations were done to explore the relationships between variables. Then two-stage cluster analysis was done to find the groups of professionals based on their scores in the burnout dimensions. When the groups or clusters had been identified, a comparison of means was done using the Student's *t* test for independent samples to determine the existence of any significant

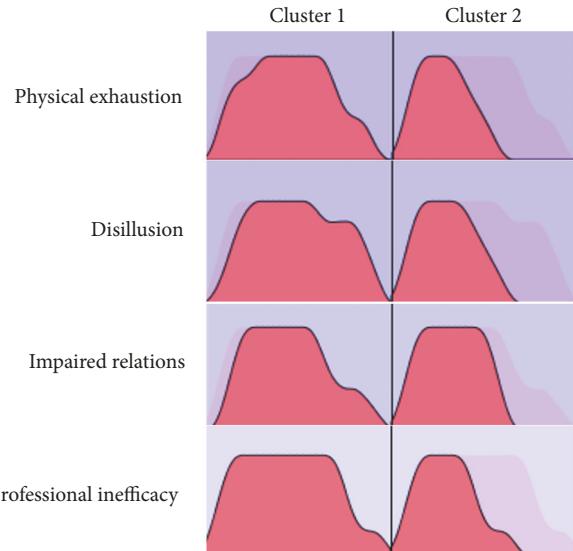


FIGURE 1: Cluster composition ($N=500$). Note. Factors are in the order of importance of input.

differences between burnout groups with respect to their perception of the educational context, perceived efficacy (personal and collective), commitment, and job satisfaction.

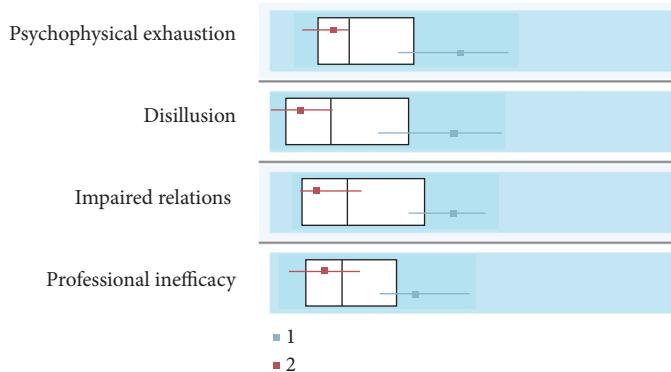
Finally, to compare the mediating effect of the perceived efficacy variables, a multiple mediation analysis was performed with two chained mediators. The macro for SPSS by Preacher & Hayes [40, 41] was used for computation of the mediation model. Bootstrapping was applied with coefficients estimated from 5000 bootstrap samples.

3. Results

3.1. Burnout in High School Teachers. A two-stage cluster analysis was done with the burnout factors to form the groups (Figures 1 and 2). Two groups resulted from inclusion of these variables with the following distribution: 32.6% ($n=163$) of subjects in Cluster 1 and 67.4% ($n=337$) in Cluster 2. Table 2 summarizes the means of evaluations of different aspects of the educational context for the total sample of teachers and for each of the clusters.

The first group resulting from the cluster analysis (Cluster 1) was characterized by scores above the mean for the total sample in psychophysical exhaustion ($M=17.83$), impaired relations ($M=17.48$), professional inefficacy ($M=14.78$), and disillusion ($M=17.67$). Therefore, the subjects in this cluster were grouped together because of their high levels in all the burnout dimensions.

The second group (Cluster 2) grouped teachers with mean scores below those found for the total sample in all the burnout dimensions: psychophysical exhaustion ($M=9.98$), impaired relations ($M=10.14$), professional inefficacy ($M=9.15$), and disillusion ($M=8.76$). That is, those in Cluster 2 coincided in having scores below the mean on the burnout dimensions.

FIGURE 2: Comparison of clusters ($N=500$).TABLE 2: Mean scores on burnout for the total sample ($N=500$) and clusters.

Burnout	Total sample ($N=500$)	Cluster	
		$\Delta \blacktriangle$ Burnout ($n=163$)	$\blacktriangledown \blacktriangledown$ Burnout ($n=337$)
Physical exhaustion	$M = 12.54 (SD = 4.99)$	$M = 17.83 (SD = 4.71)$	$M = 9.98 (SD = 2.47)$
Impaired relations	$M = 12.53 (SD = 4.93)$	$M = 17.47 (SD = 4.09)$	$M = 10.14 (SD = 3.24)$
Professional Inefficacy	$M = 10.98 (SD = 4.16)$	$M = 14.77 (SD = 4.28)$	$M = 9.14 (SD = 2.56)$
Disillusion	$M = 11.66 (SD = 5.77)$	$M = 17.67 (SD = 5.61)$	$M = 8.76 (SD = 2.88)$

3.2. Burnout in High School Teachers and Its Relationship with Perception of the Educational Context, Efficacy, Commitment, and Job Satisfaction. As shown in Table 3, the four dimensions of burnout correlate negatively with the perception of the teachers of the educational context (the management team, colleagues, technical-auxiliary staff, secretarial staff, families, students, and physical school environment). Burnout was also found to be negatively correlated with personal and collective efficacy, with organizational commitment and job satisfaction.

A Student's t test for independent samples was carried out on the groups classified based on the two-cluster solution to find any differences between the clusters with respect to the rest of the variables analyzed. As observed in Table 4, there were significant differences between the groups with high and low burnout levels for all aspects related to teacher perception of educational context, efficacy, commitment, and job satisfaction, where Cluster 1 (burnout dimension scores above the sample mean) showed lower scores in all the dimensions analyzed.

3.3. Mediation Model for Estimating Predictors and Paths of Mediation Effects of Perceived Efficacy on Job Satisfaction. Based on the results of the cluster analysis, the burnout groups (recode: \blacktriangledown Burnout=0; Δ Burnout=1) were taken as the independent or predictor variable and perceived efficacy (personal and collective) as the mediating variables. Thus the

multiple mediation model was computed with two mediator variables (M_1 : E_{pers} and M_2 : E_{colec}), with job satisfaction as the dependent variable (Figure 3).

In the first place, a statistically significant effect [$B=-7.19$, $p<.001$] of *burnout* (X) on perceived personal efficacy (M_1) was observed. The second regression analysis took as the result variable Mediator 2 (perceived collective efficacy) and included burnout (X) and perceived personal efficacy (M_1) in the equation. There was a significant effect of personal efficacy [$B=.41$, $p<.001$] on collective efficacy (M_2), but not on burnout [$B=-1.31$, $p=.137$].

In the following regression analysis, the effect of the independent variable and of the two mediators was estimated taking job satisfaction as the result variable (Y). In all cases, significant effects were observed: personal efficacy [$B=.17$, $p<.001$], collective efficacy [$B=.16$, $p<.001$], and *burnout* [$B=-1.34$, $p<.001$]. The total effect of the model was also significant [$B=-3.28$, $p<.001$].

Finally, the analysis of indirect effects was carried out using bootstrapping, and data found supported a level of significance for Path 1 [ind₁: X → M_1 → Y; $B=-1.22$, SE=.27, 95% CI (-1.84, -.73)] and Path 2 [ind₂: X → M_1 → M_2 → Y; $B=-.49$, SE=.13, 95% CI (-.78, -.28)]. In both cases perceived personal efficacy seemed to mediate the effect of burnout on job satisfaction. However, the indirect effect expressed in Path 3 [ind₃: X → M_2 → Y; $B=-.21$, SE=.16, 95% CI (-.55, .08)] was not significant.

TABLE 3: Burnout, perception of the educational context, efficacy, commitment, and job satisfaction. Correlation matrix.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
1. Physical exhaustion	—														
2. Impaired relations	.61***	—													
3. Professional inefficacy	.58***	.55***	—												
4. Disillusion	.66***	.61***	.64***	—											
Perception of the educational context															
5. Management team	—	.23***	.27***	.26***	.34***	—									
6. Colleagues	—	.21***	.20***	.29***	.28***	.61***	—								
7. Tech.-auxiliary staff	—	.27***	.21***	.25***	.26***	.53***	.55***	—							
8. Secretarial staff	—	.24***	.12***	.25***	.26***	.61***	.49***	.70***	—						
9. Families	—	.19***	.31***	.22***	.28***	.52***	.58***	.48***	.48***	—					
10. Students	—	.24***	.40***	.26***	.25***	.45***	.52***	.39***	.33***	.71***	—				
11. Physical environment	—	.20***	.16***	.20***	.26***	.50***	.47***	.47***	.51***	.47***	.36***	—			
12. Perceived personal efficacy	—	.38***	.37***	.47***	.43***	.47***	.44***	.40***	.43***	.37***	.40***	.33***	—		
13. Perceived collective efficacy	—	.18***	.21***	.23***	.26***	.67***	.63***	.53***	.55***	.58***	.53***	.54***	.43***	—	
14. Organizational commitment	—	.36***	.37***	.40***	.46***	.56***	.56***	.43***	.46***	.49***	.44***	.47***	.58***	.54***	—
15. Job satisfaction	—	.42***	.36***	.41***	.46***	.62***	.64***	.47***	.49***	.55***	.49***	.48***	.59***	.57***	.75***

Note. *** $p < .001$

TABLE 4: Perception of the educational context, efficacy, commitment, and job satisfaction. Descriptive statistics and t test by burnout group.

	Cluster 1 ▲ Burnout			Cluster 2 ▼ Burnout			t	p
	N	M	SD	N	M	SD		
Perception of the educational context								
...management team	163	38.85	7.38	337	42.55	7.78	-5.06***	.000
...colleagues	163	30.90	6.31	337	34.08	7.07	-4.86***	.000
... technical-auxiliary staff	163	20.76	4.89	337	23.57	4.20	-6.30***	.000
... secretarial staff	163	11.00	2.72	337	12.21	2.18	-4.94***	.000
... families	163	18.69	4.92	337	21.07	4.87	-5.08***	.000
... students	163	19.19	4.84	337	21.77	4.51	-5.85***	.000
... physical environment	163	19.02	5.73	337	21.65	5.07	-4.98***	.000
Perceived personal efficacy	163	65.73	9.80	337	72.92	8.29	-8.06***	.000
Perceived collective efficacy	163	47.06	8.48	337	51.38	9.79	-4.82***	.000
Organizational commitment	163	31.60	7.50	337	36.70	5.94	-7.60***	.000
Job satisfaction	163	21.93	4.87	337	25.22	3.39	-7.74***	.000

Nota. *** $p < .001$

4. Discussion

One of the first ideas inferred from the above analysis of burnout is that teachers with high and low burnout levels are clearly distinguished from each other. The percentages

found in this study were distributed as follows: fewer teachers, around a third (32.6%), showed high burnout, while most of them, 67.4%, showed low levels. We can therefore respond to our first research hypothesis, by showing the significant prevalence of burnout among high school teachers,

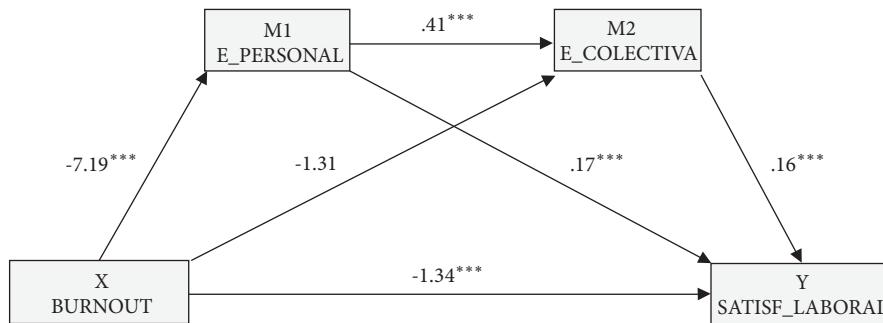


FIGURE 3: Multiple mediation model of perceived efficacy (personal and collective) on the relationship between *burnout* and job satisfaction.

considering the severe risk to health this implies. The incidence is similar to what it was several decades ago, and in view of the characteristics of the postmodern society and the current education model, could increase in the coming years if opportune measures are not taken.

The main findings of our study regarding the correlation analyses of burnout and its relationship to the perceived educational context, teacher efficacy, job satisfaction, and commitment generally coincide with analyses in previous literature and show clear evidence that the dimensions of burnout examined (psychophysical exhaustion, impaired relationships, professional efficacy, and disillusion) strongly correlate with all the variables above.

Concerning the relationship of burnout to perceived educational context, in the first place, our data showed that there was a close association between the perception of students and psychophysical exhaustion, and vice versa. The results of Klusmann et al. [8], who found that disciplinary problems in the classroom predicted a higher level of emotional exhaustion, were along this same line. One possible explanation for these results is that teachers with high psychophysical exhaustion could be using more passive strategies to cope with job demands, while teachers with less psychophysical exhaustion were able to rely on personal resources which enabled them to cope actively with conflictive situations in the classroom and be more professionally committed [9]. In the second place, the results found showed a moderate relationship between perception of the director and disillusion. These results do not coincide with those of the study by Hultell and Gustavsson [9], in which the director's social support showed a stronger connection with job commitment than burnout. This result may suggest that job commitment plays an important role in the relationship between perceived educational context and burnout, since it seems to modulate the relationship between the demands and resources and burnout [37]. Other studies have found that high scores in job satisfaction were indirectly related to better perception of support with supervision by teaching staff through emotional exhaustion and lack of personal accomplishment [12, 35]. Therefore, job commitment and satisfaction could have a mediating role in the relationship between burnout and perceived educational context, specifically, in the dimension of perception of the director. In any case, the role of these variables in the perceived educational context and burnout

should continue to be studied to progress in this line of research in the future.

Our data on the relationship between burnout and perceived personal efficacy reflected that there was a strong negative association between perceived personal efficacy and psychophysical exhaustion, coinciding with the results found in the study by Evers et al. [21]. In our study, perceived personal efficacy was significantly negatively associated with the professional burnout inefficacy and disillusion dimensions. Other studies point to the same direction [22, 24]. Furthermore, other researchers have found that lower perceived self-efficacy predicted higher burnout due to the lack of personal accomplishment [20, 21].

Results found in relation to the correlation between burnout and job satisfaction supported a strong relationship between the dimensions of burnout (psychophysical exhaustion, impaired relations, professional inefficacy, and disillusion) and job satisfaction. These data are coherent with those found by other authors [12, 27–29, 36].

Our study found that in the relationship between burnout and organizational commitment, job commitment was related moderately to psychophysical exhaustion, and more closely to disillusion. Other studies suggest, as mentioned above concerning the relationship between burnout and perception of the educational context, that job commitment must be considered a modulating variable in the relationship between perception of the educational context and burnout [37]. Ventura et al. [24] found that staff with the most self-efficacy at work perceived more challenging demands and fewer impediments, and this in turn was related to more commitment and less burnout. Studies in a healthcare context also support the existence of a significant negative correlation between burnout and job commitment [39], and others, where job commitment has been closely related to emotional intelligence [38], and high self-efficacy exerts a protector role against burnout [23].

Based on the findings mentioned, we can say that our second research hypothesis, in which we expected to find that teachers with high burnout would have higher scores in the variables analyzed (perception of the educational context, perceived efficacy, job commitment, and satisfaction), was fulfilled. Solid evidence was found demonstrating that the group of teachers with high burnout showed lower scores in perception of the educational context, professional efficacy,

satisfaction, and job commitment. Most of these results coincide with those found in other studies on burnout and perception of educational content [7–9, 12], burnout and personal efficacy [20–24], burnout and job satisfaction [12, 27–29], and lastly, burnout and job commitment [37].

Finally, empirical data in this study back our third hypothesis, showing that perceived personal efficacy exerted a mediating effect in the relationship between burnout and job satisfaction; however, the same was not true of collective efficacy. These results are coherent with those found by other researchers. Skaalvik and Skaalvik [36] found that teacher self-efficacy was significantly and positively associated with job satisfaction. Briones et al. [20] discovered that teacher self-efficacy was an indirect predictor of job satisfaction. Furthermore, with regard to collective efficacy, some researchers have found that perceived collective efficacy did not explain job satisfaction [22, 36]. Therefore, personal factors, specifically perceived personal efficacy, that is, the confidence in one's own possibilities and abilities to resolve and perform teaching functions, has more weight in the relationship between burnout and job satisfaction than social and contextual factors, such as beliefs about school management.

Given the crucial role of the mediating effects of personal efficacy perceived in the relationship between burnout and job satisfaction, action should be taken to improve confidence in one's own possibilities, by setting realistic goals adjusted to personal skills and abilities, developing high expectations about one's own performance, cultivate emotional intelligence and positive emotions, increase mental flexibility and creativity, stimulating personal initiative, and finally, support reference models to orient professional performance, promoting learning from experience (learn by doing).

This study has some methodological limitations. It is a cross-sectional design with the limitations of such studies, so it would be advisable for this research to be accompanied by other longitudinal studies. The population subject of this study was made up of high school teachers, which must be taken into account when generalizing the results. With respect to the evaluation procedures, we should mention the limitations of exclusive use of self-reports for measuring burnout, which would have to be completed with the use of other measurement instruments (direct observation, interviews), and finally, the results should be replicated and tested in other countries and cultures to broaden their reliability and validity.

Based on this study new questions are posed, for example, the role of the motivational variables in personal efficacy and its relationship with job commitment and how perception of the educational context contributes to development of the subjective wellbeing (satisfaction with life and happiness) of teachers. By way of a synthesis, we offer some final reflections on possible improvement of future interventions for burnout and job satisfaction of high school teachers: (1) due to the importance of emotional and motivational factors in teaching-learning, a teacher awareness training program on adolescent development should be started up and active coping strategies for professional demands in education, increasing their resources for improving their teaching commitment and managing stress; (2) the teaching staff should acquire

skills and abilities for classroom use of creative, participatory, and dialogical methodologies, through a close, continual, and extended consulting service; (3) contributing to teacher autonomy to improve the perception of personal efficacy through an education system which reinforces individual and collective competence.

5. Conclusions

The following conclusions may be arrived at the following. On one hand, a third of high school teachers have a high level of burnout. Our results show that when the teaching staff experiences high burnout levels, perception of the educational context is less positive. In this study, the high burnout level was associated with low scores in perceived efficacy (personal and collective), low job satisfaction, and low professional commitment.

In addition, this study demonstrates that perceived personal efficacy exerts a mediating effect on the relationship between burnout and job satisfaction. In view of these findings, we propose that burnout in high school teachers be prevented by reinforcing job satisfaction and increasing perceived teaching efficacy and that educational entities provide specific training adapted to the teaching staff and supervision, consulting, and extended support in student matters of their interest, to increase autonomy and perceived efficacy. The teaching staff should be given sufficient time and space to assimilate professional competences related to teaching. And finally, to increase job satisfaction, it is important for the teacher's work to be recognized by the educational community (family, school, students) and receive affective, social, and economic compensation in a balance between demands or requirements and results achieved.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no competing interests regarding the publication of this paper.

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Research Article

The Prevalence and Health Impacts of Frequent Work Discrimination and Harassment among Women Firefighters in the US Fire Service

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Intro. Both discrimination and harassment directly impact mental and physical health. Further, workplace discrimination degrades workplace culture and negatively impacts health behaviors, job-related outcomes, and family dynamics. Women represent a small proportion of the fire service and are often the targets of discrimination/harassment, yet little research documents the impact of such experiences. The purpose of this study was to evaluate the relationship between chronic work discrimination and/or harassment and women firefighters' (FFs) physical and mental health, substance abuse, and job efficacy, stress, and satisfaction. *Methods.* Snowball sampling was used to solicit participation from women career FFs. Participants completed an online survey regarding physical and mental health, health behavior, job efficacy/stress/satisfaction, and family well-being. Logistic regression examined the impact of work discrimination-harassment severity on dichotomous variables. *Results.* 1,773 had complete data on their experiences with work-related discrimination and harassment. Women reported experiencing verbal (37.5%) and written (12.9%) harassment, hazing (16.9%), sexual advances (37.4%), and assaults (5.1%) in the fire service. FFs in the highest tertile of work discrimination-harassment severity reported over 40% more poor health days in the last 30 days ($OR=1.42$; $95\%CI=1.33-1.51$; $p<0.001$). Women who experienced moderate and severe discrimination/harassment had negative mental health outcomes including higher prevalence of depressive symptoms, anxiety, and PTSD symptoms. Those who experienced high rates of discrimination and/or harassment also were more likely to report issues with alcohol consumption. *Conclusion.* The impact of discrimination and harassment, related negative physical and mental outcomes, low levels of job satisfaction, and negative impact of these experiences on family/home stress likely take a significant toll on women in the fire service. Findings confirm and extend previous work suggesting there is a need to improve the mental and physical health of women FFs. Future work should examine the prospective relationship between discrimination/harassment and poor health outcomes and potential policies/practices to reduce these negative behaviors.

1. Introduction

Both discrimination and harassment in the workplace, their correlates, and outcomes have been receiving an increasing amount of attention in the literature [1–8]. Discrimination occurs when an individual or organization set unfair conditions that impair the ability of another person(s) to successfully conduct their work typically based on a specific attribute such as gender and race/ethnicity [2]. Harassment, on the other hand, occurs when negative actions are taken specifically against an individual because of their status

in a protected group [2]. While general harassment can be discriminatory, people can experience discrimination without being harassed. The current work focuses on both constructs as issues of workplace mistreatment among female firefighters.

There is a large body of epidemiologic literature, spanning over several decades, demonstrating that both racial and gender-based discrimination and harassment are associated with negative impacts on mental and physical health and job-related outcomes [2, 5–9]. Work in this area is occurring worldwide [10, 11]. While studies vary considerably

with respect to how they measure discrimination and/or assess health, most consistently find associations between discrimination and/or harassment and a variety of mental and physical health outcomes (e.g., anxiety, depression, post-traumatic stress, self-rated health, overall stress response, blood pressure, cardiovascular disease, diabetes, somatic symptoms, and a number of medical conditions) [1, 2, 4, 5, 7, 8] and health behaviors (e.g., physical activity, exercise, diet, alcohol, tobacco, and other substance use) [3, 7, 8]. Various investigators have posited models explaining the impact of both discrimination and harassment on health with many suggesting that experiencing either can affect mental and physical health by impacting health behaviors that influence health outcomes and/or by increasing affected individuals' stress responses, which in turn affects health outcomes [2, 6–9].

The specific effects of work-related discrimination and harassment on health have received some attention in the peer-reviewed literature [6–8]. Okechukwu and colleagues [1] synthesized the literature on the impacts of workplace discrimination, harassment, and bullying on physical and mental health, health behaviors, job-related outcomes, and family. They proposed a conceptual model for how workplace injustices, i.e., discrimination, harassment, and bullying, can impact mental and physical health, health behaviors, and job- and family-related outcomes either directly or through other factors, such as differential exposures to occupational hazards, stress, and the influences of each of the outcome domains on one another (changes in health behaviors can impact mental and physical health, poor physical or mental health can affect job-related outcomes and family functioning, etc.). They concluded that a growing body of evidence supports the premise that workplace discrimination and harassment affect all of the outcome domains (i.e., mental and physical health, health behaviors, job-related outcomes, and family well-being) proposed in their model [1].

Women firefighters are substantially underrepresented (i.e., between 3.0–5.1% [12]) in the US fire service. In fact, among tactical professions, which also includes law enforcement and the military, the proportion of women is the lowest in the fire service. It is even lower than occupational groups like the US Marine Corps, where most job classifications involve potential exposure to combat and women were legally excluded from combat roles until 2013 [9].

Over the past 20+ years, a number of studies of women firefighters have documented troubling gender-based discrimination and harassment, although not specifically focused on the health impacts [13–18]. In the earliest studies, Yoder and colleagues [15, 16, 19] used mixed-methods studies (i.e., structured interviews and surveys) with small samples of African American (N=24) and White (N=24) women firefighters. In this series of studies, African American women firefighters reported high rates of unwanted sexual teasing and jokes, letters, notes, calls, and looks and most reported feeling as if they had been sexually harassed at some time during their firefighting career [16, 19]. Both African American and White women firefighters reported pervasive problems with being excluded from the fire service culture, usually through being provided insufficient instruction and

support, being micromanaged, and feeling hostility from their colleagues about their presence in the fire service [16, 19].

More recently, Hulett and associates [13] completed "A national report card on women in firefighting" in which they surveyed 457 women and 218 men firefighters across 48 states in the US. As well, they collected data from 114 fire departments across 39 states. In their survey, the vast majority of women firefighters (84.7%) reported experiencing different treatment based on gender. Disturbingly high proportions of women firefighters also reported high levels of shunning/isolation (50.8%), verbal harassment (42.9%), sexual advances (30.2%), and assault (6.3%).

Griffith and colleagues [17] surveyed 339 women firefighters using an Internet-based survey about their perceptions of their careers in the fire service. While the survey was not specifically focused on discrimination, more than half of the respondents (54%) indicated they did not feel they were treated as equals by their male colleagues. Griffith and colleagues [18] conducted another Internet-based survey study about perceptions of bullying in the fire service in a sample of 113 firefighters (50% women) and reported again that the majority of women firefighters believed they were treated differently based on gender (79%), but only a small proportion of men felt that way (14%; p<0.001). Women firefighters also were more likely to express the opinion that (1) supervisors did not address concerns about gender-related incidents (32% vs. 3%, p<0.001, for women vs. men, resp.); (2) gender is a barrier to career development (44% vs. 5%, p<0.001, for women vs. men, resp.); and (3) promotions are not decided fairly (41% vs. 16%, p=0.001, for women vs. men, resp.).

It is possible that discrimination and harassment increase the challenges of recruiting and retaining women firefighters, which likely has contributed in their very low numbers in fire service [13, 17, 18]. In addition to the impact of discrimination and harassment on representation, it is likely that it also negatively impacts the health of women firefighters. Rosell and colleagues [20] conducted a survey of 206 women firefighters. Women firefighters who had experienced sexual harassment were significantly more likely to report job stress (80% vs. 61%; p<0.001) and using sick leave to avoid work (29% vs. 14%; p=0.020) when compared to those who did not report being harassed. More recently, Boffa and colleagues [21] reported the results of a web-based cross-sectional survey examining correlates of suicidality and psychopathology among firefighters. In this substudy, they had 290 current women firefighters of which 22% reported a history of sexual harassment. When compared to those with no history of sexual harassment, women firefighters reporting a history of sexual harassment were significantly more likely to have experienced suicidal ideations, anxiety, depression, and insomnia symptoms and were at greater risk for PTSD.

The purpose of this study is to evaluate the impact of chronic work discrimination and harassment on women firefighters' physical and mental health, substance abuse, and job efficacy, stress, and satisfaction. While the parent study from which these data are drawn was not specifically designed to examine all forms of discrimination and

harassment (i.e., the parent study was designed to survey a broad range of health domains with a focus on reproductive health concerns), we used a well-established measure of chronic work discrimination-harassment over the past year and examined its association with a number of important health outcomes that are relevant and informative.

This study fills a critically important gap in the scientific literature as there have only been a few numbers of studies with small-medium sized samples documenting the experiences of discrimination and harassment faced by women firefighters [13–19, 22]. In addition, there are only three quantitative survey studies that examined how experiences with sexual harassment or general harassment affected a limited number of health outcomes (e.g., job stress appraisals, reported use of sick days, suicidality, and psychopathology) [20–22]. This study aims to move the field forward by considering diverse forms of mistreatment in firefighters, the relationships between them, and stress-related processes and their outcomes. Therefore, this study offers a more comprehensive picture of discrimination and harassment of women firefighters, the profession with the lowest women proportion or ratio in the US. Documenting the occurrence, frequency, and severity of chronic work discrimination and harassment and its impact on the health of women firefighters is the first critical step to understanding how these factors affect recruitment and retention and addressing the low numbers of women in the US fire service.

2. Methods

2.1. Sampling Methods. Women firefighters can arguably be described as a “hidden population” because of their extremely low representation (i.e., ≈ 5%) in the US fire service [9] and because, as mentioned in previous research, no central registry of firefighters currently exists. Thus, there is no national registry of firefighters, or women firefighters in particular, that can be used to derive a sampling frame.

Recruitment strategies are more specifically outlined in previous publications [23, 24] but included recruitment through contacts with previous participants, emails from organizations (e.g., iWomen, International Association of Firefighters), listserves (e.g., www.firefighterclosecalls.com), and through social media postings. Secondary recruitment included requesting any women who completed the survey to share the solicitation with their women colleagues. All women firefighters interested in partaking in the study were directed to a web-based survey.

2.2. Internet Survey Protocol. This study and its protocols were approved by the Institutional Review Board (IRB) of the National Development and Research Institutes, Inc. Details about the survey protocol and consent can be found in Jahnke et al. [23] and Haddock and colleagues [24]. This survey focused on women in the career fire service specifically rather than including volunteers as career firefighters are exposed to the greatest risk, are more active responding to calls, and spend more time in the culture of the firehouse [24].

Participants were directed to the online survey that first presented an informed consent document. By clicking the

link, they confirmed their consent to participate. In total, 1,773 women had complete data on their experiences with work-related discrimination and harassment. Participants were primarily from the US (98.0%) with most of the remaining residing in Canada. Table 1 contains descriptive data about the sample.

2.3. Measures. Standard individual demographics (e.g., age, race/ethnicity) and occupational history (e.g., current rank and position, years in the fire service) were collected.

2.3.1. Exposure. The *Chronic Work Discrimination and Harassment: Abbreviated* (CWDH-A) Scale, which was adapted from the Perceived Racism Scale for use in the Chicago Community Adult Health Study [10, 25–28], measures the occurrence and frequency of perceived chronic interpersonal discrimination that individuals experience at work. Women firefighters were provided an introduction that said “Here are some situations that can arise at work. How often have you experienced them in the past 12 months?” and then asked to report how often the following occurred (i.e., never, less than once a year, a few times a year, a few times a month, and at least once a week): (1) How often do you feel that you have to work twice as hard as others to get the same treatment or evaluation? (2) How often are you watched more closely than other workers? (3) How often are you unfairly humiliated in front of others at work? (4) How often do your supervisor or coworkers make slurs or jokes about racial or ethnic groups? (5) How often do your supervisor or coworkers make slurs or jokes about women? and (6) How often do your supervisor or coworkers make slurs or jokes about gays or lesbians?

Questions 1–3 are generally viewed as measuring experienced discrimination while 4–6 are viewed as measuring environments that allow harassment [27, 28]. Both scales have published reliability (Cronbach’s alpha for discrimination = 0.73 and harassment = 0.76–0.84) [27, 28]. Reliability in our sample was alpha = 0.825, 0.908, and 0.841 for the discrimination, harassment, and composite scales, respectively. Similar to previous studies using perceived discrimination scales and the CWDH-A specifically [10, 27], we scored the frequency of discrimination and harassment items on a scale of 1–5 and summed firefighters’ responses to the six questions. Thus, the potential range of scores was between 6 (no discrimination or harassment) to 30 (high discrimination and harassment), with higher scores indicating greater experiences with work discrimination and harassment.

Gender Based Harassment. We also asked women firefighters about whether or not they ever had experienced the following types of harassment because of their gender using questions from National Report Card on Women in Firefighting by Hulett and colleagues [13]: (1) verbal harassment; (2) written harassment (e.g., notes, cartoon, other written materials); (3) hazing; (4) sexual advances; and (5) assault.

2.4. Outcomes. Our outcomes assessments were modeled on the conceptual framework similar to that provided by Okechukwu and associates [1], which suggests that work

TABLE 1: Participant Demographics.

Characteristic	Mean ± SD; %
Age (years; M ± SD)	40.2 ± 9.0
Race (%)	
(i) White	91.9%
(ii) African American/Black	3.7%
(iii) Asian American	0.8%
(iv) Native Hawaiian/Pacific Islander	0.4%
(v) American Indian/Alaskan Native	0.9%
(vi) Other	2.6%
Hispanic Origin (% yes)	6.4%
Marital Status (% Married/Domestic Partner, Civil Union)	55.5%
Sexual Orientation (%)	
(i) Heterosexual/Straight	79.4%
(ii) Lesbian	14.6%
(iii) Bisexual	4.0%
(iv) Other	0.2%
(vi) Refused to Answer	1.8%
Education (% at least some college)	96.3%
Annual Household Income (%)	
(i) <\$50k	9.7%
(ii) ≥\$50k	45.3%
Rank (%)	
(i) Firefighter, Firefighter/Medic, Medic, Driver Operator	69.6%
(ii) Company Officer (Lieutenant, Captain)	24.3%
(iii) Any Chief (Battalion Chief, Assistant Chief, Deputy Chief, Chief)	6.1%
Fire Service Experience (years; M ± SD)	13.6 ± 7.9

discrimination-harassment can affect the following outcomes: (1) physical health; (2) mental health; (3) health behaviors; (4) job-related factors such as satisfaction, stress, advancement, and performance; and (5) family well-being. Thus, we assessed outcomes in each of these broad domains.

(1) *Physical Health (Obesity, Poor Physical Health Days, and Injury).* Self-reported height and weight were used to compute body mass index (BMI; kg/m²) and obesity status (BMI≥30kg/m²). Self-reported weight and height, and BMI estimates derived from them, are highly correlated with their respective measured values in US firefighters [29]. The number of poor physical health days during the last 30 days was assessed using a question from the CDC Behavioral Risk Factor Surveillance System (BRFSS): “Now thinking about your health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?” [30–32]. This question has established reliability and validity [32], is predictive of important longitudinal health care utilization and outcome variables such as physician visits, hospitalizations, and mortality, and is used as part of an overall health rating system for the US [33, 34]. In addition, it is a documented health disparity among minority firefighters [35, 36]. Finally, women firefighters were asked whether they had experienced an occupational injury in the

past 12 months based on a standard item developed for use in the fire service [37–39].

(2) *Mental Health.* Current depression was measured using the Center for Epidemiological Studies Short Depression Scale (CES-D10 [40]). The CES-D10 includes questions about the frequency of both feelings and behaviors during the past week. The CES-D10 has been found to be highly reliable among the general population (Spearman-Brown, split halves r=0.85) and in patient samples (r=0.90 [40]). A score of 4 or more is indicative of potential clinical depression.

The Mental Health Inventory Anxiety subscale (MHI-A [41]) was used to assess anxiety. The MHI-A subscale measures current (past month) symptoms of anxiety and is a widely accepted measure that has been used in a number of studies, including the RAND Health Insurance Experiment as part of an overall tool to assess psychological well-being and distress [41–43]. The MHI-A has a score range of 9–54 with higher scores indicating higher levels of anxiety. The MHI-A has demonstrated reliability (Cronbach’s alpha=0.90; one-year stability correlation=0.63) and validity when compared with other measures of psychological distress [41–43].

Symptoms of trauma were assessed with the Trauma Screening Questionnaire (TSQ). The TSQ is a brief screening

instrument that consists of 10 symptom-based questions that were experienced over the past week including intrusive thoughts, upsetting dreams, reliving of the experience, physical responses (e.g., fast heartbeat, churning stomach), sleep disturbances, irritability or angry outburst, difficulty with concentration, heightened awareness, and feeling jumpy or easily startled. A score of 6 or more positive responses suggests potential PTSD [44].

(3) *Health Behaviors (Substance Use and Physical Activity)*. Problem drinking patterns and tobacco use were assessed using standard approaches that also have been successfully implemented firefighter substance use epidemiological studies [24, 45, 46]. Problem drinking behaviors were measured by the CAGE questionnaire [47–49]. The CAGE asks the following questions: (1) Have you ever felt you should cut down on your drinking? (2) Have people annoyed you by criticizing your drinking? (3) Have you ever felt guilty about your drinking? and (4) Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover (eye-opener)? Those responding positively to two or more of the questions are considered at risk for problem drinking [48, 49].

Binge drinking was assessed with the item: “Considering all types of alcoholic beverages, how many times during the past 30 days did you have 4 drinks or more on an occasion?” [46, 47]. Driving while intoxicated was measured with the following item: “During the past 30 days, did you drive a car or other vehicle on any occasion when you perhaps had too much to drink?” Participants responded either “Yes” or “No” [47].

Current smokers were those who responded positively to the standard tobacco surveillance questions: (1) Have you ever smoked a cigarette, even just a puff? (2) Have you smoked at least 100 cigarettes in your entire life? [Note: 5 packs = 100 cigarettes]; and (3) Have you smoked a cigarette, even just a puff, in the past 30 days? Current smokeless tobacco users were participants who acknowledged using chewing tobacco, snuff, or dip in the last 30 days [45, 50].

Physical activity level was assessed using the Self-Report of Physical Activity (SRPA) Questionnaire [51–53]. The SRPA provides a global, physical activity self-rating during the last 30 days. Participants were asked to indicate their level of fitness on a scale of 0 (sedentary) to 7 (3 or more hours of vigorous activity per week). The SPRA’s validity compared to maximal oxygen consumption has been established [51–53].

(4) *Job Efficacy/Stress/Satisfaction*. Firefighter Self-Efficacy was measured using “The Firefighter Coping Self-Efficacy Scale” (FFCSE [54]). The FFCSE measures firefighters’ perceptions of self-confidence in managing on-the-job stressful and traumatic experiences. High internal consistency has been reported (e.g., Cronbach’s alpha = 0.90 - 0.92). The FFCSE exhibited strong concurrent validity with measures of work-related stress, posttraumatic stress symptoms, general well-being, and social support.

Job stress was assessed using the following questions [55]: (1) During the *past 12 months*, how much stress did you experience *at work* while carrying out your duties in the fire

service? and (2) During the *past 12 months*, how much did stress *at work* interfere with your ability to perform your duties in the fire service? Job satisfaction and organizational commitment were assessed based on the following items from previous studies [12, 35]: (1) “I am optimistic about my future success with this fire department”; (2) “I am satisfied with my job at the fire department”; (3) “I am satisfied with the morale of the people I work with in the fire service”; (4) “I am satisfied with the morale of the fire department”; and (5) “My work in the fire department gives me a sense of accomplishment.” Response options were a five-point Likert scale ranging from “Very much disagree” to “Very much agree” and scored in a continuous fashion, consistent with similar scales [56].

(5) *Family Well-Being*. To evaluate family stress associated with their role as firefighters, we asked the following question: My role as a firefighter places stress on my family. Response options were on a scale ranging from strongly disagree, disagree, neither agree or disagree, agree, and strongly agree.

2.5. Statistical Approach. Data analysis was conducted with SPSS [57]. The distribution of responses on each CWDH-A item was examined and the proportion of each response category computed. Next, participants’ total scores on the CWDH-A scale were used to categorize women firefighters into tertiles of work mistreatment severity. Means \pm standard deviation scores or percentages were calculated for all baseline demographic, physical and mental health, substance use, and job efficacy, stress, and satisfaction variables stratified by tertiles of work mistreatment severity.

With respect to the various outcome variables, we dichotomized those that had established cutoffs (e.g., BMI, CESD-10, TSQ, and CAGE). For example, we used national standards to define obesity based on BMI (i.e., $\geq 30\text{kg}/\text{m}^2$ [35, 36] and risk for depression, PTSD, and alcohol abuse based on published thresholds for their respective measures, i.e., CESD-10 ≥ 4 , TSQ ≥ 6 , and CAGE ≥ 2 [40, 44, 45]. We also dichotomized some categorical variables whose distributions indicated it, e.g., primarily bimodal distributions, and those where one category was the primary outcome of interest (e.g., current smoker vs. former and never smokers; current smokeless tobacco user vs. former and never users).

We used logistic regression to examine the impact of work discrimination-harassment severity category on dichotomous variables. Nonparametric overall and post hoc tests (Kruskal-Wallis and pairwise comparisons using the Dunn-Bonferroni approach) were used to examine group differences on the MHI-A, FFCSE, and SRPA because of the high degree of skewness in their distributions and the fact that their residuals were not normally distributed, and attempts to transform their distributions failed to normalize them.

Poisson regression [58] was used to explore the association between work discrimination/harassment severity tertile and number of poor physical health days in the last 30 days because they represent count outcomes with distributions that are typically skewed and with zeros represent the modal count (“0”) or no poor physical health days represented 54.4% of distribution. The Poisson model evaluated the effect of work discrimination-harassment severity tertile

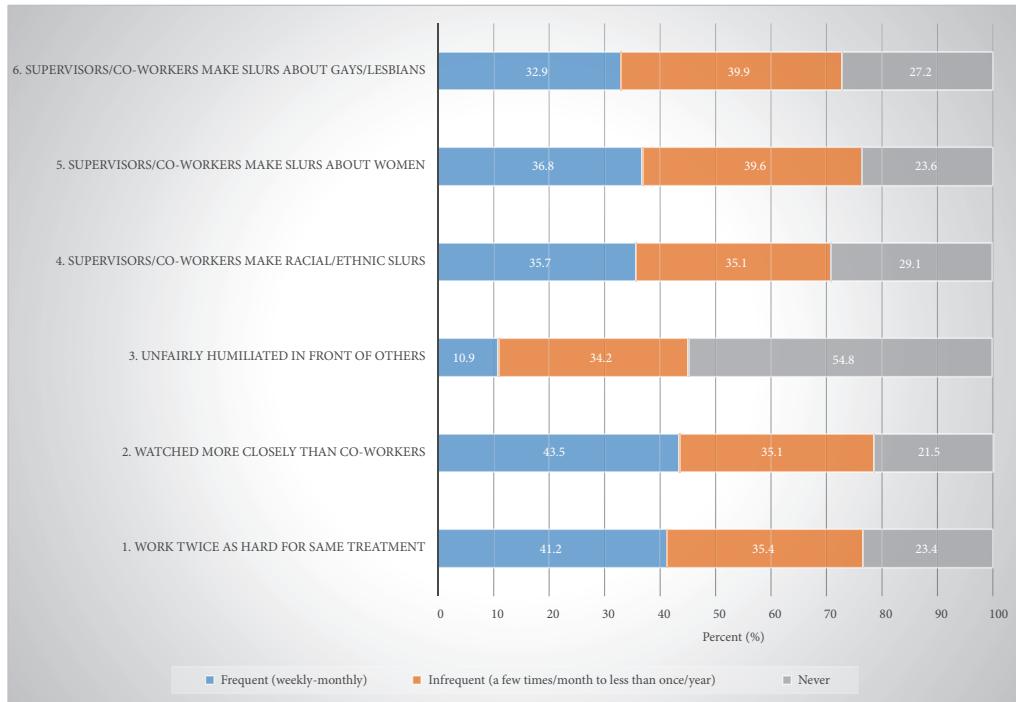


FIGURE 1: Prevalence of frequent, infrequent, and never categories of job discrimination-harassment items.

categories with output that included both β -weights and the corresponding odds ratio (OR) for each category of work discrimination-harassment severity and its association with the number of poor physical health days. For all regression models, the referent category for work discrimination-harassment severity was the lowest tertile (the low work discrimination-harassment severity category).

3. Results

3.1. Participants. A total of 2,022 women career firefighters responded to the survey. The majority were Caucasian (91.9%) and had at least some college degree (96.3%). On average, they had 13.6 years on the job ($SD=7.9$ years). Of the women who responded, 1,773 (88%) responded to the questions focused on discrimination and harassment.

3.2. Work Discrimination and Reports of Harassing Behaviors. The proportions for the different response categories for each of the CWDH-A items are presented in Figure 1.

As can be seen, over 40% of women firefighters reported that they frequently felt that they had to work twice as hard as others to get the same treatment or evaluation and that they were watched more closely than other workers. Over one-third of participants also reported frequently hearing supervisors and/or coworkers making slurs against racial and ethnic minorities, women, and gays and lesbians. Almost 11% reported frequently being humiliated in front of others at work.

Of the specific types of gender-based harassment, women reported experiencing verbal harassment (37.5%), written

harassment (12.9%), hazing (16.9%), sexual advances (37.4%), and assaults (5.1%) because of their gender while in the fire service. When examined in the context of the CWDH-A categories of work discrimination-harassment severity (see Figure 2), women in the highest tertile had significantly greater odds of experiencing each type of harassment when compared to those in the lowest tertile. For example, women in the highest tertile of the CWDH-A severity were 14.2 times (95%CI=10.5-19.1) more likely to experience verbal harassment, 8.3 times (95%CI=5.3-13.1) more likely to report written harassment, 12.4 times (95%CI=8.0-19.3) more likely to experience hazing, 6.0 times (95%CI=4.6-7.8) more likely to experience sexual advances, and 13.1 times (95%CI=5.2-33.0) more likely to report a history of assault compared to those in the lowest tertile ($p<0.001$ for all contrasts).

As shown in Table 2, even those in the middle tertile (medium severity work discrimination-harassment) had significantly greater odds of reporting the five types of harassment when compared to those in the lowest tertile for verbal harassment ($OR=3.5$; 95%CI=2.6-4.7), written harassment ($OR=2.7$; 95%CI=1.6-4.4), hazing ($OR=3.4$; 95%CI=2.1-5.4), sexual advances ($OR=2.6$; 95%CI=2.0-3.4), and assaults ($OR=5.4$; 95%CI=2.0-14.1), compared to those in the lowest tertile ($p<0.001$ for all contrasts).

3.3. Physical Health. There were no significant differences in obesity risk between women firefighters based on the severity of work discrimination-harassment in the last 12 months (see Table 2). In contrast, women firefighters in the highest tertile of work discrimination-harassment severity over the past 12 months reported over 40% more poor health days in the last

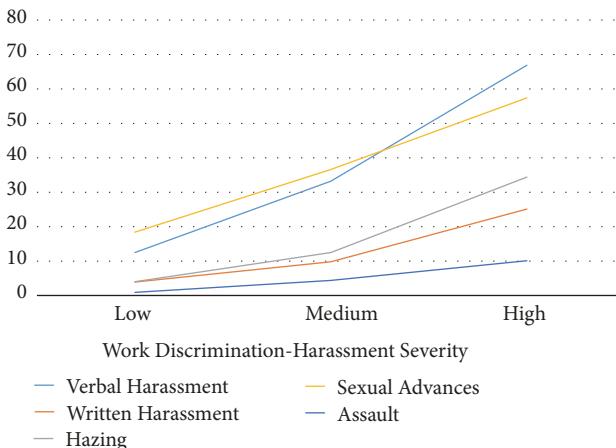


FIGURE 2: Prevalence and severity of verbal and written harassment, hazing, sexual advances, and assault.

30 days ($OR=1.42$; 95%CI=1.33-1.51; $p<0.001$) when compared to those in the medium ($OR=1.03$; 95%CI=0.96-1.10) and low (referent group) categories. The difference between those in the medium and low severity groups was not significant. Odds ratios and confidence intervals are presented in Table 3.

With respect to injury risk, there was a dose-response relationship between the severity of reported work discrimination-harassment and injuries reported in the last year (see Table 2). Women firefighters in the high ($OR=2.21$; 95%CI=1.75-2.78; $p<0.001$) and medium ($OR=1.35$; 95%CI=1.07-1.71; $p=0.011$) severity work discrimination-harassment groups were 120% and 35%, respectively, more likely to report one or more injuries in the previous 12 months when compared to those in low severity category and the difference in risk between the high and medium severity categories also was significant.

3.4. Mental Health. Odds of current significant depressive symptoms also were elevated in a dose-response manner based on severity of work discrimination-harassment. Women firefighters in the high severity group were more than 300% ($OR=4.20$; 95%CI=3.25-5.67; $p<0.001$) more likely to meet the threshold for significant depressive symptoms when compared to those in the low severity group, while those in the medium severity group were 74% ($OR=1.74$; 95%CI=1.29-2.34; $p<0.001$) more likely to meet the threshold. The difference between those in the medium and high group also was significant (see Table 3).

Reported work discrimination-harassment also was significantly associated with current anxiety symptom severity in a dose-response manner ($p<0.001$ for overall Kruskal-Wallis Test). Post hoc tests revealed that women in the high severity group scored significantly higher on the MHI-A when compared to those in the medium ($p<0.001$) and low ($p<0.001$) categories. The medium group also had significantly higher MHI-A scores than those in the low group ($p<0.001$).

Women firefighters in the high severity work discrimination-harassment group were over 150% ($OR=2.67$; 95%CI=1.82-3.93; $p<0.001$) more likely to meet the threshold

for potential PTSD when compared to the women in the low severity group. The medium group's 25% greater odds ($OR=1.25$; 95%CI=0.81-1.93; $p=0.314$) were not significantly different from the low group and the difference between the medium and high severity groups was not statistically significant.

3.5. Health Behaviors (Substance Use, Physical Activity). Women firefighters in the high ($OR=1.54$; 95%CI=1.09-2.17; $p=0.015$) and medium ($OR=1.47$; 95%CI=1.04-2.07; $p=0.029$) work discrimination-harassment severity groups were significantly more likely to demonstrate elevated odds for meeting the CAGE threshold for alcohol abuse when compared to those in the low severity category. However, there was no statistical difference between those in the high and medium groups (see Table 2).

Women in the medium severity group for work discrimination-harassment were nearly three times ($OR=2.71$; 95%CI=1.33-5.50; $p=0.006$) more likely to report having driven while intoxicated in the last 30 days when compared to those in the low group. While elevated risk also was evident in the high severity group ($OR=2.10$; 95%CI=0.98-4.32), it was not statistically different from the low or medium groups. There were no significant group differences based on severity of work discrimination-harassment on binge drinking, smoking, or smokeless tobacco use.

3.6. Job Efficacy/Stress/Satisfaction. There was an inverse relationship between women firefighters' confidence in managing on-the-job stressful and traumatic experiences, as measured by the FFCSE ($p<0.001$ for overall Kruskal-Wallis Test). Post hoc analysis revealed that women firefighters in the high ($p<0.001$) and medium ($p<0.001$) severity work discrimination-harassment groups had significantly lower scores on the FFCSE than those in the low severity group. However, the difference between the high and medium severity groups was not statistically significant.

Women firefighters who reported the most severe work discrimination-harassment also reported the most work-related stress and that stress interfered with their ability to

TABLE 2: Outcomes by Discrimination Severity.

Variable	<i>Tertiles of Harassment-Discrimination Severity</i>			p-value
	Low n=603	Medium n=578	High n=592	
<i>Demographic Characteristics</i>				
Age (years; M ± SD)	40.3 ± 9.2	40.4 ± 8.9	39.8 ± 8.9	0.452
Race (% White, Non-Hispanic)	86.3	88.7	86.6	0.420
Marital Status (% Married, domestic partnership, or civil union)	56.0	58.7	51.8	0.059
Sexual Orientation (% Heterosexual)	79.8	81.3	77.1	0.204
Education (% At least some college or higher)	95.0	97.2	96.7	0.117
Income (% \$50,000 or more)	91.1	91.5	88.4	0.146
<i>Occupational Characteristics</i>				
Years in the Fire Service (years; M ± SD)	13.4 ± 8.1	13.7 ± 8.0	13.7 ± 7.6	0.783
Rank (% Any firefighter rank)	71.5	67.6	69.8	0.452
<i>(1) Physical Health</i>				
Obesity (% BMI≥30 kg/m ²)	13.5	14.5	12.6	0.653
Number of Poor Physical Health Days (M ± SD) [‡]	2.8 ± 6.7	2.9 ± 6.7	4.0 ± 7.3	<0.001
Injuries Reported in Last Year (% 1 or more)*	36.8	44.1	56.3	<0.001
<i>(2) Mental Health</i>				
Current Depression (CESD-10 Depression Cutoff; % ≥4)*	15.1	23.6	43.3	<0.001
Current Anxiety Symptoms (MHI Anxiety Score Total; M ± SD)**	16.4 ± 6.5	17.7 ± 5.9	21.1 ± 7.6	<0.001
Current PTSD Symptoms (TSQ Cutoff; % ≥6)*	6.9	8.5	16.5	<0.001
<i>(3) Health Behaviors (Substance Use, Physical Activity)</i>				
CAGE Cutoff (% ≥2)*	13.4	18.6	19.2	0.027
Binge Drinker (% yes)	45.5	52.9	47.4	0.056
Drove While Intoxicated (% yes)*	2.2	5.7	4.4	0.014
Smoke Cigarettes (% current)	4.0	5.9	4.8	0.120
Smokeless Tobacco Use (% current)	1.5	1.2	1.2	0.846
Physical Activity Level (SRPA; M ± SD)	5.7 ± 1.4	5.5 ± 1.5	5.5 ± 1.5	0.787
<i>(4) Job Outcomes (Efficacy/Stress/Satisfaction)</i>				
FFSE Score Total (M ± SD)*	118.8 ± 14.3	115.4 ± 12.3	113.8 ± 13.0	<0.001
How Much Stress at Work (% a lot)*	16.7	23.4	40.3	<0.001
Stress Interferes With Work (% a lot)*	1.0	1.7	6.4	<0.001
Optimistic about future success in fire department (% agree/strongly agree)*	82.1	71.4	51.5	<0.001
Satisfied with job in fire department (% agree/strongly agree)*	89.2	80.0	59.9	<0.001
Happy with choice to be a firefighter (% agree/strongly agree)*	93.4	90.1	84.3	<0.001
Would recommend being a firefighter to other women (% agree/strongly agree)*	82.6	72.9	59.7	<0.001
Happy to spend the rest of career with fire department (% agree/strongly agree)*	88.7	77.3	59.3	<0.001
<i>(5) Family Well-Being</i>				
Role as a Firefighter Places Stress on Family (% agree/strongly agree)*	24.0	32.3	55.1	<0.001

Note: *Dichotomous outcomes were modeled using logistic regression. **The MHI-A, FFSE, and SRPA were modeled using nonparametric overall and post-hoc tests. [‡] Number of poor physical health days in the last 30 was modeled with Poisson regression.

TABLE 3: Odds Ratios and Confidence Intervals.

Variable	Work Discrimination & Harassment Severity (CWDH-A)		
	Low Severity (Referent Group)	Medium Severity	High Severity
Discrimination & Harassment ^b		OR (CI) ^a	OR (CI) ^a
Verbal Harassment	-	3.49 (2.58 to 4.70)*	14.20 (10.54 to 19.13)*
Written Harassment	-	2.70 (1.64 to 4.44)*	8.30 (5.26 to 13.10)*
Hazing	-	3.37 (2.09 to 5.44)*	12.41 (7.97 to 19.32)*
Sexual Advances	-	2.57 (1.97 to 3.37)*	6.00 (4.61 to 7.82)*
Assault	-	5.38 (2.04 to 14.15)*	13.13 (5.23 to 32.96)* ^f
Physical Health			
Poor Health Days ^c	-	1.03 (0.96 to 1.10)	1.42 (1.33 to 1.51)*
Injury Risk ^b	-	1.35 (1.07 to 1.71)*	2.21 (1.75 to 2.78)*
Mental Health ^b			
Depression	-	1.74 (1.29 to 2.34)*	4.20 (3.25 to 5.67)*
PTSD	-	1.25 (0.81 to 1.93)	2.67 (1.82 to 3.93)* ^f
Health Behaviors ^b			
Alcohol (CAGE)	-	1.47 (1.04 to 2.07) ^h	1.54 (1.09 to 2.17) ^{h,f}
Driving Intoxicated	-	2.71 (1.33 to 5.50) ^h	2.10 (0.98 to 4.32) ^f
Job Outcomes ^b			
Work-related stress	-	1.52 (1.14 to 2.03) ^h	3.36 (2.57 to 4.40)*
Stress-Interfering	-	1.74 (0.63 to 4.83)	6.79 (2.85 to 16.19)* ^f
Optimism	-	0.55 (0.41 to 0.72)*	0.23 (0.18 to 0.30)*
Satisfaction	-	0.48 (0.35 to 0.67)*	0.18 (0.13 to 0.25)*
Recommend FF	-	0.57 (0.43 to 0.75)*	0.31 (0.24 to 0.41)*
Happy with Career	-	0.43 (0.31 to 0.60)*	0.19 (0.14 to 0.25)*
Happy rest of career	-	0.65 (0.42 to 0.99) ^h	0.38 (0.26 to 0.57)* ^f
Family Well-Being ^b			
Stress on Family	-	1.69 (1.33 to 2.15)*	2.91 (2.30 to 3.70)*

Note: ^aOdds Ratios given with confidence interval. ^bLogistic Regression, ^cPoisson Model. * Statistically significant ($p<0.001$); ^hStatistically significant ($p<0.05$); ^fStatistically significant difference between medium and high severity groups.

carry out their firefighter duties over the last year. Women in the high severity work discrimination group were more than 200% ($OR=3.36$; 95%CI=2.57-4.40; $p<0.001$) and nearly 600% ($OR=6.79$; 95%CI=2.85-16.19; $p<0.001$) more likely to select the highest categories ("a lot" in the last 12 months) of work-related stress and stress interfering with their ability to do their jobs when compared to those in the low severity group.

Women firefighters in the medium severity group also were significantly more likely ($OR=1.52$; 95%CI=1.14-2.03; $p=0.004$) to report "a lot" of work stress in the past 12 months and the difference between those in the high and medium groups also was significantly different on the stress item. There was no significant difference between women firefighters in the medium ($OR=1.74$; 95%CI=0.63-4.83; $p=0.285$) and low work discrimination-harassment severity groups on the stress interference item, nor was the difference between high

and medium work discrimination groups risk significantly different.

With respect to the five job satisfaction items, four (i.e., optimism about future; satisfaction with job; recommend being a firefighter, and happy to spend rest of career as a firefighter) demonstrated the same inverse dose-response patterns, with those in the high severity work discrimination-harassment group being significantly less likely to report they agreed or strongly agreed that they were optimistic about their future ($OR=0.23$; 95%CI=0.18-0.30; $p<0.001$), were satisfied with their job in the department ($OR=0.18$; 95%CI=0.13-0.25; $p<0.001$), would recommend being a firefighter to other women ($OR=0.31$; 95%CI=0.24-0.41; $p<0.001$), and would be happy to spend the rest of their career with their fire department ($OR=0.19$; 95%CI=0.14-0.25; $p<0.001$) when compared to the low severity group.

Those in the medium severity group for work discrimination-harassment also were significantly less likely to agree or strongly agree with the above four items ($OR=0.55$; $95\%CI=0.41-0.72$; $p<0.001$ for optimism; $OR=0.48$; $95\%CI=0.35-0.67$; $p<0.001$ for job satisfaction; $OR=0.57$; $95\%CI=0.43-0.75$; $p<0.001$ for recommending job to other women; and $OR=0.43$; $95\%CI=0.31-0.60$; $p<0.001$ for being happy to spend the rest of their career in their fire department). The differences between the high and medium work discrimination-harassment severity groups also were significant.

On the item about their happiness with their choice of being a firefighter, both the high ($OR=0.38$; $95\%CI=0.26-0.57$; $p<0.001$) and medium ($OR=0.65$; $95\%CI=0.42-0.99$; $p<0.047$) work discrimination-harassment severity groups were significantly less likely to agree or strongly agree when compared to the low severity group, but the difference between those in the high and low groups was not significant.

3.7. Family Well-Being. Women firefighters in the highest and middle tertiles of work discrimination-harassment were nearly three times ($OR=2.91$; $95\%CI=2.30-3.70$; $p<0.001$) and 69% ($OR=1.69$; $95\%CI=1.33-2.15$; $p<0.001$) more likely agree or strongly agree that their role as a firefighter placed stress on their family. In addition, OR for those in the high severity work discrimination-harassment was significantly higher than that found for women firefighters in the middle tertile.

4. Discussion

An alarming number of women reported experiencing gender-based harassment while at work. More than a third reported verbal harassment and a similar number reported sexual advances. Slightly more than 5% reported experiencing assaults. These results are similar to those in military populations where 27% of women report unwanted sexual attention and 8% of women report sexual coercion [59].

Our data show that women firefighters in the medium and high tertiles of chronic work discrimination-harassment on the CWDH-A were significantly more likely to report incidents of verbal and written harassment, hazing, sexual advances, and assault than women in the lowest tertiles, demonstrating disturbingly high rates of these incidents in a mostly dose-response fashion on discrimination-harassment severity gradient of CWDH-A tertiles. In addition, it also provides data on the excellent concurrent validity of the CWDH-A and the work discrimination-harassment severity categories created from it for the subsequent analyses.

Consistently, women who experienced moderate and severe discrimination and harassment had negative mental health outcomes including higher prevalence of depressive symptoms, anxiety, and symptoms of PTSD. Those women who had experienced high rates of discrimination and harassment also were at high risk for potential issues with alcohol consumption as measured by the CAGE questions. The highest severity group also was least likely to be satisfied with their job or recommend being a firefighter to others

which lends credence to the suggestion that discrimination and harassment lead to recruitment and retention issues [13].

The impact of discrimination and harassment, the related negative physical and mental outcomes, the low levels of job satisfaction, and the negative impact of these experiences on family/home stress likely take a significant toll on women in the fire service. While the current study did not examine suicidal ideation directly, examination of death certificates indicates that women in the protective services (law enforcement and fire service) have the highest rates of suicide of any of the professions studied [60]. The high rates of discrimination and harassment reported and the negative outcomes related to these experiences are potential explanations for these rates.

Discrimination and harassment also were related to injuries in the past 12 months. Given the cross-sectional nature of the data, it is unclear whether the injuries increased risk for discrimination and harassment or vice versa. However, data from Hollerbach and colleagues [61] suggests that women may push themselves harder than necessary and put themselves in unsafe settings to “prove” themselves to their male colleagues. It is plausible that these efforts put women who experience chronic discrimination and harassment at higher risk.

The current study is the largest to date of career women firefighters examining the impact of chronic work discrimination-harassment on health status. Considering that there are approximately 350,000 career firefighters in the US and that women represent between 3.5%-5.1% ($\approx 12,250-17,850$ [12, 13, 62]), our study likely represents 9.9%-14.5% of all women firefighters in the US, with representation from all but one US state. Thus, while not a random sample, our sample and the resulting data are the largest and most representative sample of career women firefighters to date.

5. Study Limitations

The primary limitations of this study are the sampling method and the potential for response bias, the fact that the parent study from which these data are drawn had very different goals, the cross-sectional design, and the fact that all physical and mental health and job-related outcomes were based on self-report. As we noted earlier, there is no logically feasible method enumerating the sampling frame for women firefighters in the US (i.e., there are no national lists of firefighters in the US and departments typically are reluctant to release personnel data). Thus, the sampling approach used in this study represented the most reasonable strategy to reach a large number of women firefighters. And as we noted previously, our sample size represents a large proportion of the total estimated number of career women firefighters in the US.

The parent study was designed as a mixed-methods investigation that included an epidemiological survey of women firefighters examining a broad range of health concerns, with a particular focus on reproductive health concerns. The focus on reproductive health was justified because anecdotal data and a few limited studies indicated that women firefighters

have concerns about the impact of firefighting job tasks on their reproductive health, which ultimately may impact recruitment and retention of women firefighters [12]. However, that focus limited our ability to thoroughly examine other potentially important domains relevant to this paper. Nevertheless, we used a well-known and validated measure of chronic work discrimination-harassment, as well as strong measures for the other health domains. It should be noted that the harassment measured by the CWDH-A focuses on harassment in the work environment but does not ask specifically about personal experiences with harassment. Future research should ask specifically about personal experiences.

Also, because the study was cross-sectional, it is not possible to determine the direction of relationships between work discrimination-harassment and health outcomes. Future work should explore prospective relationships between discrimination, harassment, and the effect on health outcomes. All outcome measures were based on self-report. However, measures such as self-reported weight and substance use have been found to be highly correlated with objectively measured outcomes [29, 45, 63]. The study also focused solely on women so direct comparisons to the men in the same settings was not possible. Further, the survey relied on valid and reliable measures of health status and experience. In addition, the number of poor physical health days is used as an index of health-related quality of life and has demonstrated predictive validity with both health care utilization and mortality [33, 34].

6. Implications

Findings confirm and extend previous work on this topic that suggests there is a considerable amount of work to be done to improve the mental and physical health of women firefighters. For instance, behavioral health programs and health/wellness programs in the fire service should highlight the increased risks women experience related to discrimination and harassment. Education about the impact of this workplace mistreatment should be included as part of the behavioral health trainings. It is likely that discrimination and harassment of women, a relative minority in the fire service, undermine their access to the main protective benefit of the camaraderie and bonding so common in the fire house [64]. Future work should also examine the prospective relationship between discrimination and harassment and poor health outcomes as well as potential policies and practices that can reduce these negative behaviors. Examining the intersectionality of gender, race, and gender identity will also likely prove useful among this population [65].

Overall, this study highlights the high rates of both perceived discrimination and harassment among female firefighters. While rates of behavioral health concerns among females in the fire service tend to be higher than rates in the published literature for male firefighters [66, 67], the current study suggests that this relationship might be due to experienced or perceived discrimination or harassment. In fact, when examining those with limited experiences of discrimination or harassment, rates of behavioral health

concerns closely mirrored those evidenced among male firefighters. It is possible that being singled out and receiving negative differential treatment not only has a negative impact on behavioral health directly but also robs firefighters being discriminated against or harassed of the camaraderie that has been found to be so protective for firefighters [64]. In addition, while the current study did not specifically examine their impact on recruitment and retention, findings do have implications for what fire departments need to consider to effectively recruit and retain a more diverse workforce. It is clear that departments need to be vigilant about preventing and addressing discrimination and harassment both with policy and actions as they clearly lead to poor outcomes among women in the fire service. Allowing these issues to go unchecked could logically lead to women choosing to leave the fire service.

Data Availability

The deidentified dataset used to support the findings of this study are available from the corresponding author upon request and completion of a data sharing agreement and the approval of the NDRI signing official.

Conflicts of Interest

The authors do not have any conflicts of interest to declare.

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Research Article

Mental Health and Rheumatoid Arthritis: Toward Understanding the Emotional Status of People with Chronic Disease

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Introduction. Rheumatoid arthritis (RA) is a long-term disorder significantly impairing the somatic, emotional, and psychological functioning of its sufferers. Previous research has shown that affected individuals are characterized by an increased level of anxiety and depression. Currently, there are two main treatment schemes for RA; the first uses anti-inflammatory drugs, and the second utilizes biologic agents. This begs the question whether sufferers differ in intensities of pain, anxiety, and depression depending on the type of treatment and what the determinants of these affective states in patients treated using different methods are. **Methods.** The study comprised 85 patients affected by RA (including 57 receiving biologically inactive medication). Research participants filled out a set of questionnaires measuring levels of anxiety and depression, intensity of experienced pain, strategies of coping with pain, and ego resiliency. **Results.** The collected data was analyzed through intergroup comparisons, calculating simple correlation coefficients, developing and solving regression equations. The results imply that the choice of treatment differentiates the intensity of pain experienced by patients. Those receiving biologic agents reported lower levels of pain compared to those taking anti-inflammatory medication. It has also been noted that there are distinct configurations of conditions conducive to anxiety and depression in both anti-inflammatory and biologic agent groups. **Discussion.** The observed constellation of dependencies between variables indicates that the choice of treatment scheme differentiates pain levels. This confirms the assumption that pain intensity, coping strategies, and ego resiliency depend on the severity of anxiety and depression.

1. Introduction

Chronic illness is indicated by the World Health Organization as the leading cause of premature death in the world. According to WHO's estimates, it is responsible for 63% of all fatalities [1]. Chronic illness is defined by its slow progression and long duration, two traits which force patients to adapt to new, changed circumstances, and which affect most aspects of life, usually negatively, consequently significantly lowering health-related quality of life [2].

One chronic illness severely altering its sufferers' ability to function is rheumatoid arthritis (RA). RA is the most common rheumatic disorder among connective tissue disorders. It is a persistent, progressive inflammatory process beginning in the synovial membrane, leading to the deformation and destruction of articular tissues, and the impairment of articulatory function [3]. Typical age of onset is between 40 and 60 years and incidence is 3 to 4 times higher in women than in men. A person affected by rheumatoid arthritis experiences numerous somatic problems, such as the deformation and

deterioration of joints, chronic pain, fatigue, weight loss, and fever. Besides these, the sufferer must also deal with psychological hardships, primarily marked by negative affect: anxiety, depression, feelings of loss, and social difficulties related to changes in fulfilling social roles [4].

The theoretical approach based on which we can understand the processes of adaptation to chronic disease is the Transactional Model of Stress and Coping [5]. This approach assumes that a stress transaction is a complex process in which a number of consecutive phases can be distinguished: the occurrence of an event, its cognitive evaluation, dealing with its consequences. Additionally, the stress transaction process is modified by the available resources [6]. In this perspective, resources act as a mediator between the different stages of a stress transaction. For example, due to its high mental resilience, a person is able to flexibly adjust coping strategies to the requirements of the situation [7]. In the proposed study, we investigated coping (coping with pain), resources (ego-resilience), and consequences (pain, depression, and anxiety).

A basic problem that RA patients must cope with is pain. As the disorder advances, pain levels usually increase [8]. The unpredictability of pain is one trait disrupting well-being; patients cannot predict the end of an ongoing episode of pain nor the onset of another one. This negatively impacts the sufferers' emotional state and greatly increases their negative affect.

Among the psychological consequences of RA, in the foreground are changes in the sufferer's emotional life, considered an effect of pain and growing impairment [9]. Individuals affected by RA experience anxiety and depressive symptoms to a greater degree than the general population. It is estimated that between 14% and 62% of those afflicted with RA also suffer from depression [10–14]. Its occurrence is explained through either neuroimmunobiological or psychological mechanisms. The neuroimmunobiological hypothesis points to proinflammatory cytokines, responsible for disrupting the serotonergic system, as playing the dominant role in the development of depressive symptoms [15]. The psychological approach, on the other hand, assumes that increasing impairment resulting from gradual deterioration of joint function causes feelings of helplessness, powerlessness, and worthlessness, which contribute to the emergence and persistence of depressive symptoms.

Research on the consequences of depression in RA patients indicates that individuals exhibiting complex depressive symptoms are more susceptible to repeated recurrence of intense pain [16–18]. Experiencing depressive symptoms further hinders coping and living with illness, which manifests as frequent hospitalizations and medical appointments among other things [19]. The question remains open whether a lower mood and exhibiting symptoms of depression are antecedents sensitizing to pain, or consequences of pain [20]. Research results are inconclusive. A two-way dependency is described: on one side, the level of depression makes it possible to predict the degree of future physical and psychological impairment; on the other, physical limits caused by illness are predictors of future depression levels [21]. As such, the dependencies have the properties of a vicious cycle.

Another emotional state typical for RA is anxiety. The proportion of individuals with an increased level of anxiety stands between 21% and 70% of sufferers [13]. Some researchers suggest that symptoms of anxiety surpass depression levels in this group [22, 23]. Frequently, the sufferer fears a relapse of illness accompanied by intense pain. In many cases, this fear escalates into panic. Since fear and anxiety function as motivators to avoid threatening circumstances [24], this may lead sufferers to avoid any situations where pain could be exacerbated, especially those connected with professional or everyday activity [25].

Using the transactional model of stress [5, 26], potential determinants of anxiety and depression are the intensity of pain (specific element of the stressful life event), strategies for coping with pain, and ego resiliency. RA sufferers face the necessity of managing many hardships and problems caused by the disorder, the most important including experiencing pain, limited mobility, and uncertainty as to the disorder's further development. Among these challenges, pain probably disrupts the sufferer's everyday life to the highest degree; hence one of the most commonly posed research questions regarding this group is how they cope with pain and how their coping strategies influence their functioning. Therefore, it becomes essential to isolate specific coping strategies, which provide affected individuals with the greatest relief from pain [27].

One classification of strategies of coping with pain was proposed by Rosenstiel and Keefe [28]. They distinguished seven strategies: diverting attention, reinterpreting pain sensations, catastrophizing, ignoring pain sensations, praying and hoping, coping self-statements, and increasing activity levels. The strategies are assigned to three factors: cognitive coping and suppression, diverting attention and substitute activities, and catastrophizing.

Ego resiliency is another potentially significant condition. It is the individual's ability to adapt their level of control over internal impulses to the requirements of the current situation [29]. Ego resiliency is considered to be one of the most important positive strategies for adapting to stressful situations, as it is assigned the role of managing coping strategy choice [11, 30]. In the context of illness, individuals with a high level of ego resiliency use more effective (compared to low-resiliency individuals) crisis-coping techniques; they are therefore more capable of balancing the positive and negative emotions that they experience and exhibit a higher overall degree of self-control. A relationship between ego saliency and a tendency to choose strategies involving active coping has also been noted, which translates into increased efficacy and feelings of agency.

The pathogenesis of rheumatoid arthritis is not fully identified. RA is treated as an autoimmune disorder, wherein white blood cells attack the organism's own tissues. This process manifests in the presence of immune complexes in the synovial fluid, synthesized with the involvement of the rheumatoid factor (RF), that is, antibodies against IgG. It is assumed that the rheumatoid factor initiates and maintains the inflammatory process in joints, though how and why it starts and sustains the course of illness remains an unknown.

One popular hypothesis is that of viruses or bacteria triggering [31, 32].

Because the primary cause of rheumatoid arthritis has not been discovered, treatment is symptomatic. The goal of pharmacological therapy is to halt the progress of disease and so induce remission. The drugs used over the course of RA largely have analgesic, anti-inflammatory, or immunosuppressive properties. They can modify the course of the underlying condition (most desirable) or merely ease the symptom-related pain, providing relief to patients. There are two basic groups of medication. The first are analgesic and anti-inflammatory drugs, including nonsteroidal anti-inflammatory drugs (NSAIDs) and glucocorticosteroids (GCs). The second are drugs modifying the course of the illness, including biologically active substances. Biologic agents are currently the newest and most advanced form of treatment. They are characterized by a decidedly increased efficacy compared to nonbiologic drugs, as they can more effectively thwart the organism's immunological response, leading to remissions which last several years.

Because there are currently two main methods of pharmacologically treating RA, i.e., using either anti-inflammatory or biologically active drugs, an interesting question arises: does the pharmacotherapy used differentiate patients' pain and levels of anxiety and depression? Additionally, is the level of anxiety and depression determined by a different configuration of psychological variables?

2. Methods

2.1. Study Participants. 85 rheumatoid arthritis patients hospitalized on rheumatoid wards took part in the study. They were aged between 29 and 76 ($M=48.94$; $SD=14.31$). An average of 14.86 years has passed since the initial diagnosis ($SD=9.31$). Women, numbering at 68 (80%), dominated the research group which is consistent with epidemiological data. The participants were treated using biologic agents (57 participants, 67.1%) and standard anti-inflammatory drugs (28 participants, 32.9%). A difference in age has been noted between the treatment groups ($M_B = 45.32$; $SD_B = 13.74$; $M_{NB} = 56.32$; $SD_{NB} = 12.70$; $t = -3.55$; $p < 0.001$; Cohen's $d = 0.83$), which was expected, as biological treatment is suggested for younger patients. However, no difference was noted in illness duration ($M_B = 14.35$; $SD_B = 8.28$; $M_{NB} = 15.87$; $SD_{NB} = 11.24$; $t = 0.70$; $p = 0.484$) nor in gender (women_{NB} 25 (29.21%); men_{NB} 3 (3.53%); women_B 43 (50.56%); men_B 14 (16.50%); $\chi^2 = 2.250$; $p = 0.134$).

The study was anonymous and voluntary. It used a questionnaire method. Patients filled out a set of four questionnaires, including the Hospital Anxiety and Depression Scale (HADS) [33], the Ego-Resiliency Scale by Block & Kremen [34]; Polish adaptation: Kaczmarek [30], The Pain Coping Strategies Questionnaire (CSQ) [28], and Visual Analogue Scale [35]. The basic descriptive statistics of the variables measured and the reliability factors are collected in Table 1.

Hospital Anxiety and Depression Scale (HADS) [33]: it is made up of two independent subscales, estimating the intensity of anxiety and depression. The scale consists of 14

statements (e.g., "I look forward with enjoyment to things"), 7 regarding anxiety and 7 regarding depression. The study participants respond to each statement by choosing one of four possible answers (e.g., 0 as much as I ever did; 1 rather less than I used to; 2 definitely less than I used to; 2 hardly at all).

The Ego-Resiliency Scale by Block & Kremen [34]; Polish adaptation: Kaczmarek [30]: the scale is comprised of 14 items measuring the level of resiliency (e.g., *I like to take different paths to familiar places*). Participants estimate how much each statement applies to them and choose the most appropriate response on a four-point scale, where 1 indicates it does not apply at all and 4 indicates it applies very strongly.

The Pain Coping Strategies Questionnaire (CSQ) by Rosenstiel & Keefe; Polish adaptation: Juczyński [34]: the scale consists of 42 statements describing different ways of coping with pain, connected with 7 strategies: diverting attention, reinterpreting pain sensations, catastrophizing, ignoring pain sensations, praying and hoping, coping self-statements, and increasing activity levels. Participants respond using a seven-point scale marking frequency of undertaking the described action, whose extremes are 0 never do and 7 always do that (e.g., *I don't think about the pain*). Due to the large number of measured coping strategies, in order to conduct detailed analyses the strategies were reduced to three general factors isolated by the method's authors: cognitive coping and suppression, diverting attention and substitute activities, catastrophizing and hoping.

A Visual Analogue Scale (VAS) [33] was used to measure the *intensity of pain*. Patients estimated what intensity of pain they felt during the day and at night using two 10-point scales. They marked the appropriate pain level on a horizontal 10-centimeter-long line marking the space between 1 no pain and 10 worst pain imaginable.

3. Results

The first step in the analysis was to determine whether RA patients in biological and nonbiological treatments differ in the intensity of pain and levels of anxiety and depression they experience. The choice was motivated by the fact that pain is one of the most troubling physical symptoms of RA, while anxiety and depression are the most disruptive psychologically. To this end, intergroup comparisons were carried out using Student's *t*-test (see Table 2).

The analysis showed that patients undergoing biological treatment exhibited lower pain levels compared to patients treated using standard methods. They were characterized not just by lower overall pain levels, but also lower night and daytime pain. The value of Cohen's d suggests that the observed differences are high.

The second stage of analysis was to ascertain the determinants of anxiety and depression for biological and nonbiological treatment groups, separately for each group. This was done in two ways: through calculating simple correlation coefficients for the measured variables and through developing and solving regression equations. Anxiety and depression were placed on the dependent variable side of the regression equation, while the independent variables

TABLE 1: Comparison of pain, depression, and anxiety among patients in biological and nonbiological treatment: *t*-Test of differences for independent samples.

Variable	Treatment type		<i>t</i> -Test statistics			
	biological treatment (<i>n</i> =57) <i>M</i> (<i>SD</i>)	nonbiological treatment (<i>n</i> =28) <i>M</i> (<i>SD</i>)	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
Pain intensity	8.3 (4.94)	12.12 (4.85)	3.36	83	.001	.78
Daytime pain	4.71 (2.49)	6.80 (2.18)	3.78	83	<.001	.90
Night pain	3.60 (2.76)	5.32 (2.99)	2.62	83	.010	.60
Anxiety	8.26 (3.05)	9.21 (3.82)	1.24	83	.218	-
Depression	5.05 (3.21)	6.28 (3.42)	1.63	83	.107	-

TABLE 2: Descriptive statistics, reliability coefficient Cronbach's alpha.

	Range	<i>M</i>	<i>SD</i>	α
1. Pain intensity	0-20	9.57	5.20	.78**
a. Daytime pain	0-10	5.40	2.58	-
b. Night pain	0-10	4.17	2.93	-
2. Ego-Resiliency	24-55	41.67	7.03	.84
3. Cognitive coping	2-99	46.93	20.78	.91
4. Distraction coping	0-63	32.76	14.20	.88
5. Catastrophizing coping	0-64	31.36	13.67	.82
6. Anxiety	1-19	8.58	3.33	.76
7. Depression	0-13	5.46	3.31	.82

**the size of the correlation coefficient is reported because the intensity of pain was determined on the basis of two items.

were daytime pain level, nighttime pain level, ego resiliency, cognitive coping, coping through catastrophizing, and coping through diverting attention.

3.1. Determinants of Depression in Patients Undergoing Biological and Nonbiological Treatments. The analysis of depression correlates for biological and nonbiological treatments indicates that there are different factors for either group. Among patients treated using biologic agents, depression levels are related to three variables. They correlate positively with overall ($r=.27$; $p=.043$) and daytime pain ($r=.28$; $p=.036$), as well as with ego resiliency ($r=-.39$; $p=.002$). For patients in the nonbiological treatment group, depression correlates with four variables: positively with daytime ($r=.39$; $p=.039$) and nighttime pain ($r=.46$; $p=.013$), but negatively with ego resiliency ($r=-.44$; $p=.020$) and cognitive coping strategies ($r=-.49$; $p=.008$) (Table 3).

Two of the variables under consideration turned out to be significant for both treatment groups: overall pain and ego resiliency. Upon comparison, their correlation coefficients appear similar (pain level $z=.57$; $p=.028$; ego resiliency $z=.52$; $p=.030$) (Table 3).

Solving the regression equation for the biological treatment group pointed to the importance of two variables: ego resiliency ($\beta=-.41$; $p<.001$) and daytime pain levels ($\beta=.30$; $p=.014$). These two variables combined account for 22% of the variance of depression ($F=8.72^{**}$). For patients in the nonbiological treatment group, cognitive ($\beta=-.43$; $p=.011$) and nighttime pain ($\beta=.40$; $p=.018$) were significant, accounting for 35% of the variance of depression ($F=8.24^{**}$).

3.2. Determinants of Anxiety in Patients Undergoing Biological and Nonbiological Treatments. Calculating correlation coefficients made it possible to identify four variables determining the level of anxiety in patients treated with biologic agents. Positive correlations were found for overall pain ($r=.41$; $p=.001$), as well as its daytime ($r=.35$; $p=.008$) and nighttime ($r=.42$; $p=.001$) components. Negative correlations, on the other hand, were found for cognitive coping strategies ($r=-.33$; $p=.012$) (Table 4).

Among patients treated with nonbiological therapies, anxiety was determined by only one variable: daytime pain ($r=.41$; $p=.032$). Experiencing daytime pain turned out to be the only anxiety predicate shared by both treatment groups ($z=.27$; $p=.039$) (Table 4).

Solving the regression equation for the biological treatment group pointed to the importance of three variables: daytime pain ($\beta=.36$; $p=.003$), cognitive coping strategies ($\beta=-.41$; $p<.001$), and coping through catastrophizing ($\beta=.26$; $p=.038$). This set of three variables accounts for 31% of anxiety variance ($F=9.53^{**}$). For patients in the nonbiological treatment group, only daytime pain proved significant ($\beta=-.41$; $p=.032$), accounting for 13% of anxiety variance ($F=5.14^*$) (Table 5).

4. Discussion

The first conclusion that can be drawn from the analyses relates to differences found in pain experienced by patients treated with biologic agents and anti-inflammatory drugs. Analysis results showed that patients receiving biologic

TABLE 3: Correlation matrix. Correlation between pain intensity, mental flexibility, coping, anxiety, and depression.

	1	1a	1b	2	3	4	5	6	7
<i>Biological treatment</i>									
1. Pain intensity		.93** (p<.001)	.95** (p<.001)	.04 (p=.777)	.07 (p=.584)	.17 (p=.199)	.29* (p=.028)	.41** (p=.001)	.27* (p=.043)
a. Daytime pain		.92** (p<.001)	.77** (p<.001)	.05 (p=.698)	.12 (p=.389)	.13 (p=.323)	.25 (p=.063)	.35** (p=.008)	.28* (p=.036)
b. Night pain		.96** (p<.001)	.76** (p<.001)	.02 (p=.876)	.03 (p=.838)	.19 (p=.160)	.30* (p=.024)	.42** (p=.001)	.23 (p=.087)
2. Ego-Resiliency		-.01 (p=.957)	.01 (p=.977)	-.02 (p=.912)		.24 (p=.070)	.23 (p=.081)	-.08 (p=.555)	-.24 (p=.075)
3. Cognitive coping		-.16 (p=.420)	-.14 (p=.472)	-.15 (p=.433)	.40* (p=.038)		.76** (p<.001)	.28* (p=.035)	-.33* (p=.012)
4. Distraction coping		-.01 (p=.957)	.01 (p=.977)	-.02 (p=.914)	.59** (p=.001)	.55** (p=.003)		.28* (p=.038)	-.09 (p=.505)
5. Catastrophizing coping		.34 (p=.076)	.41* (p=.029)	.25 (p=.195)	.14 (p=.480)	.18 (p=.372)	.25 (p=.205)		.25 (p=.062)
6. Anxiety		.36 (p=.091)	.41* (p=.032)	.23 (p=.235)	-.18 (p=.354)	-.11 (p=.592)	-.04 (p=.840)	.37 (p=.054)	.39** (p=.003)
7. Depression		.39* (p=.039)	.24 (p=.227)	.46* (p=.013)	-.44* (p=.020)	-.49** (p=.008)	-.17 (p=.376)	-.11 (p=.581)	.20 (p=.303)
<i>Nonbiological treatment</i>									

* $P < 0.05$, ** $P < 0.01$, correlation coefficients for patients in biological treatment are reported in upper right side of the table; on the contrary, correlation for patients in nonbiological treatment is showed in lower left side of the table.

TABLE 4: Anxiety and depression predictors among patients in nonbiological treatment, stepwise regression analysis results.

Predictor	Anxiety			Depression		
	β	t	p	Predictor	β	t
Daytime pain	.41	2.27	.032	Cognitive coping	-.43	-2.75
				Night pain	.40	2.53
$R^2 = .13, F = 5.14^*$				$R^2 = .35, F = 8.24^{**}$		

agents experience lower levels of pain, both during the day and at night. The noted differences were strong. This shows that using biologically active medication alleviates one of the main symptoms of rheumatoid arthritis, pain, which lets it be assumed that a deferred consequence may be a decrease in depressive symptoms. This assumption is founded on the observation made by Zautra and collaborators [19], who noted that different affective systems were linked to different RA symptoms (pain or impairment). In patients for whom the dominating symptom was pain, an increase in its level leads to an increase in negative affect, without any effect on positive affect. Therefore, using biologic agents should mitigate the vicious cycle mechanism over time. Based on research, the mechanism can be expected to run as follows: pain, appearance of negative affect (primarily depressive symptoms), difficulties in everyday activities including treatment-related activities, which exacerbates the pain. Disrupting this process with an effective form of treatment (biologic agents) which lowers pain levels allows speculation that in the long term, levels of depression will also be lowered and effective function will be increased. The pain experience results indicate which patient group is exposed to greater severity of pain. The results indicate an increased risk group, which should be a

premise to prioritise specialist pain management in patients treated with the standard method (anti-inflammatory drugs).

No differences were noted, however, between patients in biological and nonbiological treatment groups regarding their levels of negative affect, anxiety, and depression. This may be related to the study taking place during the treatment process, while changes in mood could be delayed. As such, it has been suggested that future studies on the topic be longitudinal in nature. A different analysis approach may also be considered; namely, the dependency between pain and negative affect could be moderated by the time passed since initiating biological treatment.

The second explored issue dealt with indicators of anxiety and depression in the two treatment groups. A low pain level, personality traits, and strategies of coping with pain were considered potentially beneficial in adapting to chronic illness [11, 36].

It is assumed that pain, one of the most distressing symptoms of RA, has critical influence over the experience of negative emotions, anxiety, and depression. This thesis has been confirmed in previous research [10]. In the current study, the intensity of pain increased the likelihood of a high degree of anxiety and depression both in patients receiving

TABLE 5: Anxiety and depression predictors among patients in biological treatment, stepwise regression analysis results.

Anxiety				Depression			
Predictor	β	t	p	Predictor	β	t	p
Night pain	.36	3.07	.003	Ego-Resiliency	-.41	-3.45	.001
Cognitive coping	-.41	-3.56	.001	Daytime pain	.30	2.53	.014
Catastrophizing coping	.26	2.12	.038				
$R^2 = .31, F = 9.53^{**}$				$R^2 = .22, F = 8.72^{**}$			

biologic agents and anti-inflammatory drugs. The time at which pain was experienced differentiated the groups, however. For patients treated biologically, pain felt during sleep predicted anxiety, while daytime pain predicted depression. In the anti-inflammatory treatment group, the relationship was inverted; i.e., daytime pain predicted anxiety, while nighttime pain predicted depression.

Ego resiliency, understood as a set of subjective properties governing the ability to flexibly adapt the level of self-control to existing circumstances [29], was taken to be a personality trait pertinent to functioning effectively. The assumption is that it gives sufferers the ability to flexibly choose strategies for coping with pain while taking into account the demands of illness. Previous research has shown that ego resiliency is a key factor in activating positive emotions in difficult situations [37]. The current study aimed to investigate whether ego resiliency has a protective function against negative affect, but the resulting framework of dependencies confirmed this hypothesis only partially. The correlation coefficients obtained confirmed dependencies between ego resiliency and anxiety and depression. However, ego resiliency only demonstrated protective properties against depression in the biological treatment group. Why the variable's positive characteristics only manifested in this group of patients is unknown. The result is made surprising by the fact that previous research on ego resiliency indicated a clear positive role in inducing positive emotional states; it was reasonable to expect resiliency to be a protective factor. Since the present study aimed to describe dependencies between ego resiliency and negative emotional states, it may be suspected that different psychological processes are responsible for arousing negative and positive emotions in the context of a chronic condition. The question of ego resiliency's role in the process of activating negative emotions remains open.

Strategies of coping with pain were the third factor considered as a potential determinant of anxiety and depression. Coping is defined as the individual's efforts to manage arising demands [27]. Previous work has shown that using strategies focused on avoiding and resigning from activity mediate between perceived symptoms of illness and the level of consequent disability and mental disorders [38]. These strategies are linked to a higher risk of developing depression and an increase in the subjective experience of pain, especially in the long-term duration of illness. On the other hand, strategies such as seeking information or support contribute to a higher level of positive affect and better adjustment to illness in RA patients [39]. The present

study found that using cognitive coping strategies lowers the likelihood of depression occurring in patients treated with anti-inflammatory drugs and anxiety in patients receiving biologic agents. It was also observed that in the latter group coping through catastrophizing increases anxiety levels. This constellation of dependencies is in line with previous findings [4].

The analysis of relationships between variables showed that the strongest protective function against symptoms is provided ego-resilience and cognitive coping. Probably the role of mental resilience is related to the characteristics of rheumatoid arthritis, which is a very changeable condition. It is not clear which group of strategies for dealing with anxiety and depression symptoms will be effective at a particular stage of the disease, so it is important to be able to adapt to changing conditions, including the flexible use of those strategies. For these reasons, it seems particularly important to develop mental resilience in this group of patients, regardless of the chosen treatment method. Moreover, it seems worthwhile to design and conduct experimental studies in which patients will develop resistance as a result of psychological interventions and check whether its development will help to reduce the symptoms of the disease.

Despite their scientific value, our research has a number of limitations that need to be taken into account when interpreting the results. The limitations of the studies are that they were conducted on a very specific group of hospitalized patients. This implies that the results of the study can only be applied to a group of patients with acute symptoms of rheumatoid arthritis. In future studies, analyses should also be carried out on other groups of patients, i.e., outpatient clinics. In addition, patients were treated as a homogeneous group in regard to the severity of the disease. In future studies, it would be worth taking into account the severity of the disease estimated, e.g., by means of the DAS—Disease Activity Score—a scale for assessing the level of activity of symptoms of rheumatoid arthritis. As well as check if the disease activity interacts with the other variables studied.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Research Article

The Perception of Psychosocial Risks and Work-Related Stress in Relation to Job Insecurity and Gender Differences: A Cross-Sectional Study

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Introduction. The perception of psychosocial risks exposes workers to develop work-related stress. Recently the attention of scientific research has focused on a psychosocial risk already identified as “job insecurity” that regards the “overall concern about the continued existence of the job in the future” and that also depends on worker’s perception, different for each gender. **Aim of the Study.** The aim of this cross sectional study is to show if job insecurity, in the form of temporary contracts, can influence the perception of psychosocial risks and therefore increase worker’s vulnerability to work-related stress and how the magnitude of this effect differs between genders. **Materials and Methods.** 338 administrative technical workers (113 males and 225 females) were administered a questionnaire, enquiring contract typology (permanent or temporary contracts), and the Health Safety Executive questionnaire to assess work-related stress. The Health Safety Executive Analysis Tool software was used to process collected questionnaires and the Wilcoxon rank-sum test was used to evaluate the statistical significance of the differences obtained. **Results.** Workers with temporary contracts obtained lower scores than workers with permanent contracts in all the domains explored by the Health Safety Executive Analysis questionnaire, statistically significant ($P < 0.05$). The female workers obtained lower scores than male workers in all domains explored by the Health Safety Executive questionnaire. **Conclusions.** Authors conclude that perception of psychosocial risks can be influenced by job insecurity, in the form of temporary contracts, and increases worker’s vulnerability to work-related stress and differs between genders.

1. Introduction

World Health Organization (WHO) defines work-related stress as “a condition characterized by physical, psychological, or social suffering or dysfunction, which arises from the feeling of not being able to respond to requests or to live up to expectations” [1]. Work-related stress (WRS) is a complex phenomenon and develops when multiple psychosocial risk factors coexist and interact. Psychosocial risks arise from the interaction from work content, work organization, technological and environmental conditions, and workers’ skills, resources, and needs [2].

The psychosocial risks that influence more the perception of stress are excessive workloads, a lack of decisional autonomy in the management of one’s work, a lack of support by colleagues or superiors, the presence of relational conflicts in the workplace, the under evaluation of one’s role within the company, and a the lack of involvement in the changes of company organization [3]. Chronic exposure to psychosocial risks has been associated with a wide range of mental and physical disorders, including anxiety, depression, suicide attempts, sleep disorders, back pain, chronic fatigue, digestive problems, autoimmune diseases, impaired immune function,

TABLE 1: Population data: mean ages (standard deviation), contract type.

	Num (%)	Mean Age (SD)	Contract type	
			Permanent contract N (%)	Temporary contract N (%)
Total	338 (100%)	44,14 (12,5)	206 (61%)	132 (39%)
Males	113 (33,43%)	44,33 (11,8)	68 (60%)	45 (40%)
Females	225 (66,57%)	44,03 (12,9)	138 (61%)	87 (39%)

cardiovascular diseases, hypertension, and peptic ulcers [4–12].

In 2008, a deep economic crisis started in the US and rapidly spread around the world, severely affecting the labor market. In this context many companies had to reduce the number of workers to limit their expenses and reorganized their internal structure to maintain the same level of efficiency and competitiveness, also by using different types of work contract: permanent contracts, temporary contracts, agency contracts, freelancers, and zero hour contracts [13–15].

The subsequent increase in the precariousness of employment focused the attention of scientific researches on a psychosocial risk already identified as “job insecurity” [16].

Job insecurity is regarded as the “overall concern about the continued existence of the job in the future” [17]. One of the causes of job insecurity is temporary work contracts, because they do not guarantee to workers the prospective of future work [18–24].

Job insecurity not only depends on objective conditions, such as different contract typologies, but also depends on the worker’s perception of their situation, which is different for each gender, as well as their cognitive evaluation, coping skills, and social support [25–27].

Gender has significant implications on the role that workers are likely to assume within the company. For example, female workers tend to be less influential on social dynamics than their male counterparts are, and this phenomenon often leads to less prestigious roles, lower salaries [28], lower overall job satisfaction [29], and consequently lower performance at work [30].

The aim of this research is to show, through a cross sectional study, if the perception of psychosocial risks can depend on job insecurity, in the form of temporary contracts and can increase worker’s vulnerability to work-related stress and how the magnitude of this effect differs between genders.

2. Methods

During the health surveillance activities carried out pursuant to the current legal framework in 2017, the authors included in this cross-sectional study a population of $N = 338$ administrative technical workers (113 males and 225 females) employed at the same company, with an 8:30 a.m.–17:15 p.m. working time.

A clinical medical history questionnaire was administered to all subjects, with details about contract typology (permanent or temporary contracts); contract typology was

corporate’s exclusive decision and was not agreed with workers. Temporary contracts are biennial in length and can be either renewed or converted into permanent contracts on their expiration.

The Health and Safety Executive (HSE) questionnaire was also administered to all subjects for WRS assessment. Table 1 shows the structure of the sample.

The HSE questionnaire was developed by the Health and Safety Executive [31, 32].

The questionnaire is a useful tool designed to assess working conditions likely to cause work-related stress; it consists of 35 items rated on 5-point Likert scale, where higher scores indicate better working conditions and lower stress risk and define 7 different domains corresponding to as many primary factors of work-related stress risk:

- (i) Demands: it explores issues such as workload, work patterns, and the working environment.
- (ii) Control: it focuses on workers’ decision-making autonomy.
- (iii) Support: this domain is analyzed and divided into two types, namely, in terms of “support from managers” and “support among colleagues”, and includes encouragement, sponsorship, and resources provided by the organization, line management, and colleagues.
- (iv) Relationships: it explores promotion of positive work practices to avoid conflicts and deal with unacceptable behaviour.
- (v) Role: whether workers understand their role within the organization and whether the organization ensures that no conflicts occur.
- (vi) Change: how organizational change (large or small) is managed and communicated within the organization.

Questionnaires were uploaded to the HSE Analysis Tool, a specific software that analyzes them and classifies workers into four risk groups for each of the seven domains:

- (i) Those below the 20th percentile (20% of the lowest reference values), for which corrective action is urgently required (d).
- (ii) Those below average ($<50\%$, but still above the 20th percentile rank), for which corrective action is required (c).
- (iii) Those at or above average ($\leq 50\%$), but below the 80th percentile and not requiring action (b).
- (iv) Those at or above the 80th percentile, for which no corrective action is required (a).

TABLE 2: Total population (male and female): HSE score of permanent and temporary workers, median, first (Q1), and third (Q3) quartiles of the HSE scores obtained and statistical significance by Wilcoxon rank-sum test.

	Permanent contract N=206		Temporary contract N=132		P-value
	HSE score	Median value (Q1-Q3)	HSE score	Median value (Q1-Q3)	
Demands	3,25b	3,25 (2,87-3,62)	2,98c	2,875 (2,50-3,37)	p=0.000
Control	3,64b	3,66 (3,16-4,16)	3,23c	3,16 (2,83-3,66)	p=0.000
Managers' Support	3,35c	3,40 (2,80-4,00)	3,06d	3,10 (2,40-3,70)	p=0.002
Peer Support	3,66c	3,75 (3,25-4,00)	3,48d	3,50 (3,00-4,00)	p=0.034
Relationships	3,46d	3,50 (2,75-4,25)	3,07d	3,00 (2,25-4,00)	p=0.000
Role	4,21b	4,20 (4,00-4,80)	3,74d	3,80 (3,40-4,20)	p=0.000
Change	3,24a	3,33 (2,66-4,00)	2,96c	3,00 (2,16-3,66)	p=0.003

^aPerformance classified as very good. ^bPerformance classified as good, with potential for improvement. ^cPerformance classified as requiring improvement.

^dPerformance classified as requiring urgent improvement measures.

Comparison with the benchmark was used to establish priorities for action and to set short- and long-term performance targets for each of the scales [25].

The HSE Analysis Tool software was used to process collected questionnaires and three distinct profiles (total population, male population, and female population) were highlighted, in relation to contract typology (permanent and temporary contract).

Subsequently, authors used a nonparametric statistical analysis for independent samples, Wilcoxon rank-sum test, to evaluate the statistical significance of the differences in scores obtained for each of the seven domains of the three distinct profiles (total population, male population and female population), in relation to contract typology (permanent and temporary contract).

All questionnaires were self-administered, collected, and checked to make sure they had been properly and fully completed. All subjects confirmed their awareness of the sensitive nature of the data being collected and agreed for this data to be processed anonymously and collectively, through the appropriate scientific procedures, in accordance with the principles of the Declaration of Helsinki.

The statistical calculations were performed using STATA 14 software.

3. Results

3.1. Total Population (Males and Females). As shown in Table 2, the total population with temporary contracts reported low HSE scores (c-d) in all the explored domains; instead the total population with permanent contracts reported low HSE scores (c-d) in three domains: Managers support, Peer support, and Relationship. The Wilcoxon rank-sum test showed significant differences (p value < 0,05) in all

explored domains, between the population with temporary contracts and the population with permanent contracts.

3.2. Male Population. As shown in Table 3, the male population with temporary contracts reported low HSE scores (c-d) in the domains: Control, Managers support, Peer support, Relationships, and Role; instead male workers with permanent contracts reported low HSE scores (c-d) in the Relationship domain. The Wilcoxon rank- showed significant differences (p value < 0,05) in all explored domains, except for the Demand domain, between the male population with temporary contracts and the male population with permanent contracts.

3.3. Female Population. As shown in Table 4, the female population with temporary contracts reported low HSE scores (c-d) in all the explored domains; instead female workers with permanent contracts reported low HSE scores (c-d) in domains: Managers support, Peer support, Relationships, and Role. The Wilcoxon rank-sum test showed significant differences (p value < 0,05) in domains: Demand, Control, Relationship, and Role, between the female population with temporary contracts and the female population with permanent contracts.

4. Conclusion

Our analysis showed that workers with temporary contracts, compared to workers with permanent contract, are more vulnerable to psychosocial risks, which increase susceptibility to develop WRS. In fact, the results obtained showed that the total population with temporary contracts requires corrective interventions in all domains, whereas workers with

TABLE 3: Male population: HSE score of permanent and temporary workers, median, first (Q1), and third (Q3) quartiles of the HSE scores obtained and statistical significance by Wilcoxon rank-sum test.

	Permanent contract N=68		Temporary contract N=45		P-value
	HSE score	Median value (Q1-Q3)	HSE score	Median value (Q1-Q3)	
Demands	3,22b	3,25 (2,75-3,62)	3,11b	3,00 (2,75-3,50)	p=0.186
Control	3,96a	4,00 (3,33-4,66)	3,28c	3,33 (2,83-3,83)	p=0.000
Managers' Support	3,53b	3,40 (2,80-4,20)	3,12d	3,20 (2,60-3,60)	p=0.009
Peer Support	3,78b	3,75 (3,25-4,37)	3,39d	3,25 (3,00-3,75)	p=0.008
Relationships	3,51d	3,75 (2,75-4,50)	3,02d	2,75 (2,50-3,50)	p=0.007
Role	4,40a	4,60 (4,00-4,80)	3,58d	3,60 (3,00-4,20)	p=0.000
Change	3,63a	3,66 (3,16-4,00)	3,14b	3,00 (2,66-3,66)	p=0.000

^aPerformance classified as very good. ^bPerformance classified as good, with potential for improvement. ^cPerformance classified as requiring improvement.

^dPerformance classified as requiring urgent improvement measures.

TABLE 4: Female population: HSE score of permanent and temporary workers, median, first (Q1), and third (Q3) quartiles of the HSE scores obtained and statistical significance by Wilcoxon rank-sum test.

	Permanent contract N=138		Temporary contract N=87		P-value
	HSE score	Median value (Q1-Q3)	HSE score	Median value (Q1-Q3)	
Demands	3,28b	3,25 (2,87-3,62)	2,93d	2,87 (2,37-3,37)	p=0.000
Control	3,49b	3,50 (3,00-4,00)	3,22d	3,16 (2,83-3,50)	p=0.000
Managers' Support	3,29c	3,40 (2,60-4,00)	3,05d	3,00 (2,40-3,80)	p=0.050
Peer Support	3,61d	3,70 (3,25-4,00)	3,55d	3,50 (3,00-4,00)	p=0.508
Relationships	3,46d	3,50 (2,75-4,25)	3,12d	3,25 (2,25-4,00)	p=0.035
Role	4,13c	4,20 (3,80-4,60)	3,84d	3,80 (3,40-4,40)	p=0.000
Change	3,08b	3,00 (2,66-3,66)	2,89c	3,00 (2,00-3,66)	p=0.127

^aPerformance classified as very good. ^bPerformance classified as good, with potential for improvement. ^cPerformance classified as requiring improvement.

^dPerformance classified as requiring urgent improvement measures.

permanent contracts require corrective interventions on three domains: Manager support, Peer support, and Relationship. As already described in literature, contract typology (in the form of either temporary or permanent contracts) can impact worker's wellness and corporate stability in two ways: by worsening social relations with both peers and superiors and by lowering performance level [33]. In fact, workers with temporary contracts report less overall satisfaction and lower wellness levels, as a direct effect of the uncertainty of their future employment [34].

Our analysis also showed that female workers, compared to male workers, are more vulnerable to psychosocial risks,

regardless of contract typology, and this increases their susceptibility to develop WRS.

In fact, the results obtained showed that female workers with temporary contracts require corrective interventions in all domains, whereas male workers with temporary contracts require corrective interventions in the domains: Control, Managers support, Peer support, Relationships, and Role.

Female workers with permanent contracts require corrective interventions in the domains: Managers support, Peer support, Relationships, and Role, whereas male workers with permanent contracts require corrective interventions in the domain Relationship.

This finding emphasizes that female workers are more vulnerable to psychosocial risks and that gender differences must be considered for WRS assessment and prevention [35].

Some studies have already demonstrated that the perception of psychosocial risks and WRS depends on cognitive evaluation and coping strategies, which differ between genders [36]. For example, male workers tend to adopt problem-focused coping behaviours, which are effective in dealing with emerging problems; instead, female workers are more likely to adopt emotional-focused coping behaviours, which lead to more introspection and make them more vulnerable to the effects of stress on mental health [37, 38]. In addition, the greater vulnerability that female workers showed might be related to social norms, exposing the female gender more widely to work-family conflicts [39]. This topic has gained so much relevance that the European Occupational Safety and Health Agency (OSHA-EU) has presented the need for additional research on work-family interactions, with the aim of identifying the balance most compatible with health [40].

Job insecurity, in the form of temporary contracts, influences the perception of psychosocial risks and increases worker's vulnerability to WRS, even after adjusting for gender. As a result, the combination of job insecurity, in the form of temporary contracts, and female gender increases worker's susceptibility to WRS.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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