

## *Retraction*

# **Retracted: Effects of Age-Appropriate Mobile APP Use Behavior on Subjective Well-Being of Young Elderly**

### **Security and Communication Networks**

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

In addition, our investigation has also shown that one or more of the following human-subject reporting requirements has not been met in this article: ethical approval by an Institutional Review Board (IRB) committee or equivalent, patient/participant consent to participate, and/or agreement to publish patient/participant details (where relevant).

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

### **References**

- [1] W. Liu and W. Tang, "Effects of Age-Appropriate Mobile APP Use Behavior on Subjective Well-Being of Young Elderly," *Security and Communication Networks*, vol. 2022, Article ID 3209804, 12 pages, 2022.

## Research Article

# Effects of Age-Appropriate Mobile APP Use Behavior on Subjective Well-Being of Young Elderly

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The structural equation model was used to empirically analyze the influence of the use of age-appropriate APP on the subjective well-being of the younger elderly. The results show that the attitudes of the younger elderly towards the use of age-appropriate apps are significantly affected by perceived usefulness and perceived ease of use, and perceived usefulness has a significant effect on perceived ease of use. The willingness of the younger elderly to use apps for aging is significantly affected by behavioral attitude, subjective norms, and perceived behavioral control. The behavior of using age-appropriate APP has a significant impact on the subjective well-being of the young elderly. The use of age-appropriate apps by the younger elderly is a positive and selective behavior, which is conducive to the younger elderly to actively adapt to and accept new technologies and improve the life satisfaction of the younger elderly.

## 1. Introduction

With the continuous progress of science and technology, more and more digital products affect people's lives. According to China's seventh national census, the number of elderly people aged 60 and above has reached 264.02 million, among which 147.4 million are aged 60–69, accounting for 55.83% of the total elderly population [1]. According to the report of China Internet Network Information Center, in October 2021, the number of silver-haired Internet users over the age of 60 has reached 123 million. The elderly are in the wave of digital transformation, and there is a huge digital gap when they use intelligent technology products. The sixth plenary session of the 19th CPC Central Committee called for “making people's sense of gain, happiness and security more substantial, secure and sustainable.” It is the solemn commitment of the Party and the state to realize the people's aspiration for a happy life [2]. The happiness of the elderly is also the focus of our government. More and more elderly people begin to use intelligent products, but in this process, it is found that the elderly are unable to skillfully use and cannot use intelligent

products, which makes it inconvenient to use mobile phones and leads to the reduction of self-perceived efficacy [3]. In order to close the digital divide faced by the elderly, we should support the growth of intelligent aging in China and allow elderly groups to benefit from the rapid development of information technology and high-tech products. In 2019, The General Office of the State Council issued the Opinions on Promoting the Development of Elderly Care Services, which made it clear that the new generation of information technology, such as the Internet, big data, artificial intelligence, and 5G technologies and their products, should be fully utilized to apply them to the lives of the elderly. In 2021, the Ministry of Industry and Information Technology, PRC organized special work on Internet age-friendliness and accessibility, issued the Universal Design Code for Mobile Internet Apps (APPS), and accelerated efforts to add “age-friendly” versions of mobile apps. By October 2021, 104 websites and apps have initially completed the age-friendly transformation, such as Taobao's “elder mode” and WeChat's “care mode,” so that the elderly can use simpler and more convenient APP software for social activities, learning, and entertainment [4].

Only in recent years, China has paid attention to the research of the aged and the products of wisdom for the aged. In the study on the willingness of the elderly to use smart products for the aged, the design of smart products for the aged is more complex, and the operation of smart products is more difficult than traditional products for the aged, which makes the elderly more prone to cognitive, sensory, and other psychological disorders, and the willingness of the elderly to use is not strong [5]. In addition, there is a “silver gap” in the use of senior-appropriate products for the elderly, and their willingness to use is not high [6]. Through in-depth research on the psychological characteristics of the elderly, Han Zhenqiu believes that the elderly have a dislike and fear of intelligent products, which is a typical “technophobia” [7]. These studies have found that the future of the elderly’s willingness to use smart aging products is not ideal. The internal factor is that the elderly have psychological disorders, their own learning ability is insufficient, the external reason is that the design and use of smart products for the elderly do not fully consider the individual needs of the elderly group, and the society has not formed a new technology use atmosphere with the elderly as the main group. So, for the elderly, can the implementation of the “age-friendly version” mobile APP enhance the happiness of the elderly? What factors affect the use of ageing apps in the elderly? This study integrates the behavioral theory of the program with the technical acceptance model, tries to establish a theoretical model of influencing factors of the use of age-appropriate APP by young people on the intention of aging APP, discusses the impact and how the use of age-appropriate APP by young people on subjective happiness under the background of digital empowerment, and tries to explore a new path to improve the happiness of young elderly people in the context of intelligence.

## 2. Literature Review and Research Hypothesis

*2.1. Literature Review.* In the 1960s, research on subjective well-being was carried out abroad. In 1960, Wilson raised the research on subjective well-being to the theoretical level. Taking this as a watershed, foreign scholars began to study the influencing factors of subjective well-being. In the West, subjective well-being involves multidisciplinary research such as philosophy, psychology, sociology, and ethics. E-unhook Sun and Ed Diener studied cross-cultural and subjective well-being and concluded that the subjective well-being of collectivists mainly comes from other members of the group’s standardized norms and self-experience; subjective well-being mainly comes from the individual’s own emotional experience [8]. Scholars in economics have studied individual subjective well-being from the perspective of absolute income and relative income. Through research, they have found that the increase of absolute income has a positive impact on subjective well-being [9]. Scholars have also found that factors such as unemployment and divorce also significantly affect individual subjective well-being [10].

Chinese research on the subjective well-being of the elderly began in the 1990s and was only gradually taken

seriously in 2000. Liu Rengang and Gong Yaoxian’s research on the subjective well-being of the elderly focuses on the impact of the physiological condition of the elderly [11]. Through their research, they found that the inner depression, self-anxiety, and hostility to the environment in the elderly can all have an impact on their subjective well-being; with the continuous deepening of research, the study of the subjective well-being of the elderly has not only been fully developed in the field of medicine but also developed into the fields of sociology and psychology. Related studies have studied the factors affecting the subjective well-being of the elderly from the aspects of living environment [12], regional factors [13], intergenerational support [14], and physical exercise [15]. In recent years, scholars have begun to study the subjective well-being of the elderly population from a macro level. Deng analyzed the social relationships of the elderly group and found that the relationship between husband and wife, intergenerational, neighbors, and relatives has a significant effect on the subjective well-being of the elderly [16]. Liu and Dong specifically studied the subjective happiness of new media use and the elderly, and the results showed that the subjective happiness of the elderly was significantly improved by using the new medium [17]. Peng et al. conducted a research survey on the happiness of the elderly in the process of using the Internet, and the results of the study proved that after the use of the Internet, the incentive of personal capital for happiness will be significantly reduced, and the study further confirmed that there are obvious differences in the happiness of the elderly with different academic levels when they use the Internet [18]. The above studies show that the subjective happiness of the elderly will be affected by multiple external and internal factors of the elderly themselves, and the subjective happiness of the elderly group is a popular research field for researchers.

At present, in the study of the influencing factors of the elderly population on the willingness to use smart aging products, the academic community generally uses the improved and modified user willingness model for research and analysis. In the study on the influencing factors of the use of TAM model on the willingness of the elderly population, Luo et al. found that seven variables such as age, income, living status, health status, perceived usefulness, technical anxiety, and subjective norms are important factors influencing the elderly to choose smart elderly care services [19]. Mao and Li used the UTAUT model to study the influencing factors of the elderly in Wuhan on the willingness to use the “one-push-to-talk” intelligent old-age service and found that the six variables such as convenience, social impact, performance expectation, effort expectation, cognitive safety, and emotional trust all had a positive impact on the willingness of the elderly to use [20]. Wang analyzed the influencing factors of the elderly’s use of Internet products from three aspects: family endowments, new human capital, and macro opportunities. The study found that factors such as education level, self-health status, personal income, and social cognition significantly affected the use of the Internet in the elderly [21]. Based on the analysis of the survey data of Anhui Province, Yao et al. pointed out that

the perceptual usefulness, perceived ease of use, and subjective norms are the key influencing factors affecting the use of smart products for the elderly, while performance expectations and convenience conditions have an indirect positive promotion effect [22]. In general, academics are still developing their understanding of the desire of older adults to use smart aging products, and they only combine as many subjective and objective aspects as they can after enhancing and updating the relevant models.

In summary, at present, there are few studies on the use of smart aging products and the subjective well-being of young and elderly people in China. In this study, the influence of the use behavior of adaptive mobile APP on the subjective well-being of young and elderly people was studied through a structural equation model, and the influencing factors were studied in depth. The main innovations of this study are as follows: first, the study integrates the improved technology acceptance model and the planned behavior theory, which provides empirical support for the innovation and development of related theories; second, this study focuses on the use of age-appropriate APP and subjective happiness research in the digital context of young elderly people, which broadens the research scope in the field of elderly care.

## 2.2. Theoretical Analysis

**2.2.1. Theory of Planned Behavior.** Fishbein and Ayez proposed a rational behavior theory through the study of the individual behavior of consumers, which is mainly applied to study how the use of two variables of attitude and subjective norms affects the willingness of individuals to behave. The assumption of rational behavior theory presupposes that the individual has sufficient rationality and that the individual's behavioral activities are controlled by their will. Since the rational behavior theory does not take into account the influence of the nonwill part on individual behavior, in order to compensate for the shortcomings of the rational behavior theory, Ajzen proposed a planned behavior theory model based on the rational behavior theory [23]. Planned behavior theory holds that an individual's behavior patterns are significantly influenced by three variables: subjective norms, usage attitudes, and individual perceptual behavior control [24]. Planned behavior theory is an extension and innovation of rational behavior theory, which is used in more and more related fields of research.

**2.2.2. Technology Acceptance Model.** Based on the theory of rational behavior, Davis proposed a model of technological acceptance in his research on the adoption of information systems by individuals, which was originally used to explore the reasons for the general acceptance of computer systems by individuals. Since the technology acceptance model was proposed, it has been widely used by scholars to study new ideas, new technologies, and new things [25]. The traditional technology acceptance model has six dimensions: external variables, perceived usefulness, perceived ease of use, usage attitude, willingness to use, and actual use behavior [26].

Perceptual usefulness is defined as the degree, to which individuals improve their work performance when using a system, and this study defines the perceived usefulness of young and elderly people for ageing apps. Perceptual ease of use refers to the degree, to which the individual perceives that the application of the system is effortless and not difficult, in which perceptual ease of use has a positive effect on the perceptual usefulness to a certain extent. Usage attitudes refer to the positive or negative feelings that an individual subjectively has in the process of using an operating system, as well as the impact of subjective evaluation on the performance of a certain behavior. Willingness to use is a measure of the intensity with which an individual's willingness to perform a particular action is measured [27]. Intelligent aging products are an emerging technology product for young and elderly people and are suitable for technology acceptance models to study the influencing factors of the use of ageing products. Moreover, whether to choose an age-appropriate product with the characteristics of general consumption behavior can be studied using the theory of planned behavior.

**2.2.3. Hypothesis Model.** The research uses the technical acceptance model and the planned behavior theory, both of which are based on the further development and evolution of the rational behavior theory, and the homology and articulation of the theory provide the possibility for the integration of the two. The technology acceptance model points out that the use behavior of the system or technology is affected by the willingness to act, the willingness to use the behavior is determined by the joint determination of the perceptual usefulness and the use attitude, and the user's attitude is affected by the perceptual usefulness and the perceived ease of use [28]. Planned behavior theory holds that if an individual has a positive attitude toward a particular action and feels that the action conforms to his or her own subjective norms, and if he has enough resources and skills to master the behavior, then the individual will form a strong will to act, and the probability of the behavior will be greatly improved [24].

Therefore, this study attempts to integrate the two homology theories, use the fused model to carry out the hypothesis and empirical evidence of the subjective happiness of young people, and construct a model and hypothesis diagram for the use of aging-appropriate APPs and the well-being of young people, as shown in Figure 1.

**2.3. Research Assumptions.** Subjective well-being is defined as a comprehensive cognitive and emotional assessment of an individual's quality of life and qualities. Subjective well-being is a more subjective and overall evaluation of an individual about himself, which can be used to assess emotional responses and life satisfaction over a longer period of time. Current academic research on subjective well-being generally operates as "an individual's overall perception of how happy they are in life [29]."

Studies have shown that the emergence of new technologies will improve the quality of life of the elderly to a

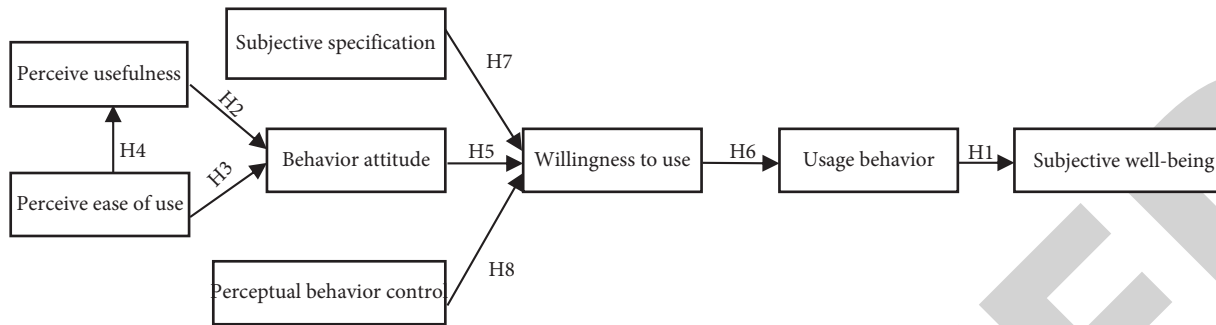


FIGURE 1: Model and hypothesis diagram of ageing APP use and happiness in young and elderly people.

certain extent [30]. In a study on the use of social media by the elderly, Deng found in a study sampled from the elderly population in Shanghai that age and social activities have a positive relationship with the positive emotions they generate by using social media; since the satisfaction obtained after using social media is greatly related to age, disposable income, and education level, the use of social media has an important role in the subjective happiness of the elderly [31]; Guo et al. found that Internet use affects the social networks of youth groups and provides social support for high-status groups in network resources, thus affecting the subjective happiness of young people [32]. From this, this study proposes the following assumptions:

H1. The use of age-appropriate APP is positively correlated with the subjective well-being of young and elderly people.

Davis' technology acceptance model is a study of users' attitudes toward technological innovation, which believes that the user's behavioral intentions significantly affect the actual behavior of users, and the two most important influencing factors for the user's behavior and behavioral intentions are perceived usefulness and ease of use [28]. A study on the use of Alipay APP mobile payment by young people shows that perceived ease of use is the key to the use of Alipay for mobile payment by the study subjects, and the perceived usefulness and perceived ease of use significantly affect the attitude of young people to the use of Alipay [33]. Based on the above discussion, the study proposes the following assumptions:

H2. The usefulness of perception has a positive effect on the use of APP for aging in young and elderly people.

H3. Perceived ease of use and the attitude of using app for aging in young and elderly people have a positive effect.

H4. There is a significant positive relationship between perceptual ease of use and perceptual usefulness.

Studies have confirmed that the willingness to use has a significant impact on consumers' actual use behavior [34]. The use of will can be interpreted as a behavioral intention, and the stronger the individual's attitude toward an object or an action, the stronger the actual intention of the act expressed, and the more willing he is to act [35]. Therefore, this study proposes the following assumptions:

H5. The use attitude of age-appropriate APP in young and elderly people is positively correlated with the willingness to use age-appropriate APP behavior.

H6. The willingness of young and elderly people to use age-appropriate APP is positively correlated with the actual use of age-appropriate APP.

Subjective norms are the social pressures that individuals feel when they can implement a specific action, and the subjective norms used by the elderly in ageing apps mainly come from the suggestions or behaviors of important family members and their surrounding peers [36]. Studies have shown that subjective norms significantly influence individual acceptance and use of new technologies [37]. Perceptual behavior control refers to the reflection of the experience that the individual has accumulated and the obstacle to future expectations, when the individual thinks that he has more opportunities and resources, the less expected obstacles will be, then the stronger the individual's perceptual behavior control over behavior [38]. Armitage's research shows that subjective norms and perceptual behavior control have a good interpretation and prediction effect on the behavior and intention of individuals [39]. Based on the above discussion, this article proposes the following assumptions:

H7. Subjective norms have a significant positive effect on the willingness of young elderly people to adopt age-appropriate APPS.

H8. Perceptual behavior control has a significant positive effect on the willingness of young elderly people to adopt age-appropriate APP.

### 3. Research Design

3.1. *Data Sources.* Changsha, Zhuzhou, and Xiangtan in Hunan Province were selected as early as 2017 for the list of pilot cities for the reform of home and community elderly care services supported by the central government, and according to the seventh census data, the number of elderly people in Changsha, Zhuzhou, and Xiangtan is also very representative. As the capital city of Hunan Province, Changsha has the largest number of elderly people in the province, the number of elderly people in Zhuzhou City ranks at the middle level in Hunan Province, and the

number of elderly people in Xiangtan City ranks low in the province. Therefore, Changsha, Zhuzhou, and Xiangtan in Hunan Province are representative of this study area. According to Wu Zhongguan's definition in the "Population Science Dictionary," the young elderly refer to the elderly between the ages of 60 and 69. According to the data of "2021 Elderly Mobile Phone Use," 68.1% of the elderly use mobile phones for Internet activities for no less than 4 hours a day, of which the elderly population that is biased towards younger age accounts for a relatively large proportion. The younger-aged elderly generally have a good physiological state, a higher degree of collective communication, an average educational level, and a higher frequency of use of smart electronic products than the elderly, so this study takes young elderly people in the range of 60 to 69 years old as the research object.

In this study, three administrative districts of Changsha City (Furong District, Yuhua District, and Yuelu District), one administrative district of Xiangtan City (Yuhu District), and two administrative districts of Zhuzhou City (Tianyuan District and Hetang District) were selected by using a stratified sampling method. The members of this research are composed of members of Dr. Liu Wei's research group (Liu Wei, Tang Weihong, Shi Fengni, Li Mengting, Ouyang Shuangxi, Liu Xinru, and Liu Xiaoxu). Each member of the research team has undergone professional training before conducting the research. The members of the research team cooperate in division of labor, and the members cooperate in pairs. One is responsible for distributing the questionnaires and instructing the filling, and the other team member is responsible for collecting and recording all data. The research team conducted field research in 12 randomly chosen communities among the aforementioned six administrative regions, and team members assisted the younger seniors who had used the age-appropriate app by completing surveys on their behalf. Before the official questionnaire was distributed, the research team conducted a pre-investigation on the young elderly in Furong District, Changsha City and distributed 50 preinvestigation questionnaires. After analyzing and processing the results, the research team decided to formally distribute the questionnaire. The questionnaire requires that the age of the elderly must be between the ages of 60 and 69. The questionnaire consists of two parts: the first part is the basic information of the respondents, and the second part uses the Likert 5 scale, in which 1 indicates "very much agreed," 2 means "relatively agreed," 3 means "basic consent," 4 means "disagrees," and 5 means "strongly disagree." A total of 400 questionnaires were distributed, and the processing of all the questionnaires was completed by October 2021; 38 questionnaires with obvious errors and unanswered questionnaires were eliminated, and a total of 362 valid questionnaires were collected; the survey effectiveness rate of the questionnaire was 90.50%. The samples in this study meet the minimum sample value requirements for structural equation model analysis  $N=100-150$  [40].

**3.2. Sample Characteristics.** Among China's current elderly population, there are more female elderly people than male elderly population [41]. From Table 1, the basic

characteristics of the survey subjects can be seen, and the male-female ratio of the sample study is in line with the normal proportion of the current elderly population in China. From the perspective of age level, the proportion of elderly people under 66 years old in this survey is relatively high, accounting for 81.8%, indicating that the age structure of the elderly who use age-appropriate APP in the young elderly group tends to be younger. From the perspective of education level, most of the young elderly in junior high school and below are low, and the number of young people with high academic qualifications is relatively small. Overall, the basic characteristics of the research objects are in line with the overall characteristics of the current elderly population in China, and the research objects are representative.

**3.3. Variable Definition and Measurement.** Any surface in a structural equation model requires a minimum of three topics. The study variables of the model are defined according to the study topic and the observation variables are set accordingly (Table 2).

**Perceptual Usefulness.** This observation variable has three items: (1) using the age-appropriate APP can meet my Internet needs, (2) using the age-appropriate APP provides convenience for my network life, and (3) the age-appropriate APP is an indispensable software in my smartphone.

**Perceptual Ease of Use.** This observation variable has four questions: (1) I think the use of the ageing APP is easy, (2) I think the operation of the ageing APP is convenient, (3) I am familiar with the functions of the ageing APP, and (4) if I encounter difficulties, I am also easy to seek help from others.

**Subjective Specification.** This observation variable has six items: (1) people who are important to me think that I can be happier by using the ageing APP, (2) people who are important to me think that using the ageing APP can help me, (3) people around me use the ageing APP to affect my use, (4) people who are important to me recommend me to use the ageing APP, (5) the trend of use of ageing products prompts me to use the ageing APP, and (6) the policies introduced by the state encourage me to use the ageing APP.

**Behavior Attitude.** This observation variable has four questions: (1) the process of using the age-appropriate APP is very pleasant to me, (2) the process of using the age-appropriate app is very interesting, (3) the use of the age-appropriate app is a very wise choice, and (4) the use of the age-appropriate app can benefit me.

**Perceptual Behavior Control.** This observation variable has three questions: (1) whether I use the age-appropriate APP depends entirely on me, (2) I think using the age-appropriate app can make me happier, and (3) I can use the age-appropriate app very well.

TABLE 1: Basic characteristics of the sample.

Category	Number	Proportion (%)
Gender	Male	46.70
	Female	53.30
Age	60–63 years old	45.90
	64–66 years old	35.90
	67–69 years old	18.20
Educational attainment	Junior high school and below	61.60
	High school	26.50
	College degree or above	11.90

TABLE 2: Definitions of study variables and operability.

Study variables	Variable operability definitions	Reference sources
Perceptual usefulness	Young and elderly people believe that the use of age-appropriate apps brings usefulness to them	Chen et al. (2017)
Perceptual ease of use	The extent to which young and elderly people think that age-appropriate apps are easy to use	Chen et al. (2017)
Subjective specification	During the use of age-appropriate apps, young and elderly people are affected by the opinions of relatives and friends around them	Zhang Yaming et al. (2018)
Behavior attitude	Evaluation of the use of age-appropriate APPS by young and elderly people	Kim et al. (2016)
Perceptual behavior control	In the process of using age-appropriate apps, young elderly people believe that they have the ability to control the consequences of behavior	Zhang Yaming et al. (2018)
Willingness to use	Young seniors are or will be willing to promote, share, and continue to use age-appropriate apps	Lu Wanqing et al. (2020)
Usage behavior	The use of age-appropriate apps by young and elderly people	Zhu Chunkui et al. (2021)
Subjective well-being	Young elderly people believe that using age-appropriate apps will make their lives happier	Diener et al. (1999)

*Willingness to Use.* This observation variable has three questions: (1) I am willing to use or continue to use the ageing APP in the future, (2) I am willing to recommend the use of the ageing app to friends and relatives, and (3) I prefer to use the ageing app compared to the traditional APP.

*Usage Behavior.* This observation variable has three questions: (1) I use the age-appropriate APP every day, (2) I use the age-appropriate app to chat online, and (3) I have been using the age-appropriate app for a long time.

*Subjective Well-Being.* This observational variable has four questions: (1) my overall satisfaction with life, (2) looking back on the past I feel the meaning of life, (3) I feel that I am in a good state now, and (4) I feel that my current life is what I ideally look like.

## 4. Model Analysis and Results

*4.1. Data Reliability and Validity Tests.* In order to further test the reliability and validity of the questionnaire data, the credibility and validity tests of the statistically complete questionnaire data are carried out by SPSS 25.0 software, and the academic community usually adopts the standardized Cronbach's alpha coefficient value as the main indicator of the reliability test. Through the reliability test of the whole scale and each part of the scale, the results show that there are 8 latent variables including perceived usefulness, perceived ease of use, subjective specification, behavior attitude, perceived behavioral control, willingness to use, behavior, and

subjective well-being. The results are listed in Table 3. The numerical results are 0.832, 0.878, 0.894, 0.872, 0.834, 0.832, 0.840, and 0.862, respectively. It can therefore be concluded that the data from this scale have a high degree of confidence.

Validity testing of the data is also an essential part of the study, which is used to test whether the study data are true and valid, that is, the degree to which each indicator reflects the meaning expressed by each potential variable. When the value of the validity test result of the questionnaire is higher, the fit between the measurement results and the observation object is higher, and the survey data results have validity; conversely, when the validity test result value of the questionnaire is too low, the fit between the measurement results and the observation object is lower, and the validity of the survey data results is lacking. Using the software SPSS 25.0, the suitability test of factor analysis was performed on the data obtained from the questionnaire results, and the following data test results were obtained (Table 4). The overall validity of the questionnaire and the KMO value of the validity of each potential variable are greater than 0.6 and are within a reasonable range of values. It can be seen that the questionnaire of this study has good validity.

*4.2. Reliability and Validity Evaluation of Measurement Models.* The complete structural equation model consists of two parts: the measurement model and the structural model [42]. The study uses AMOS 24.0 software to evaluate and analyze the structural equation model and uses the maximum likelihood estimation method to calculate the CFA of

TABLE 3: Reliability statistics.

Variable name	Cronbach's alpha	Cronbach's alpha based on standardized terms	Number of terms
Overall reliability	0.920	0.919	30
Perceptual usefulness	0.831	0.832	3
Perceptual ease of use	0.876	0.878	4
Subjective specification	0.894	0.894	6
Behavior attitude	0.872	0.872	4
Perceptual behavior control	0.834	0.834	3
Willingness to use	0.832	0.832	3
Usage behavior	0.839	0.840	3
Subjective well-being	0.861	0.862	4

eight variables, and the parameter estimation includes the following four aspects: the factor load of the standardized coefficient, the reliability of each topic of the structural equation model, the composition reliability of each configuration, and the mean-variance extraction. The results of the structural equation measurement model are listed in Table 5, and the parameter significance estimates according to the numerical criteria of reliability and convergence validity show that the nonstandardized estimates of this study are significant.  $P$  values are less than 0.001, the numerical results of the factor load are between 0.739 and 0.825, and the topic reliability is greater than 0.50, which indicates that the topics set by the institute have confidence; the numerical standard requires that the composition reliability of numerical results of each configuration in the structural equation model must be above 0.60 to meet the standard; as listed in Table 5, the composition reliability values of each configuration in this study are between 0.832 and 0.894, which meets the minimum standard of composition reliability, indicating that there is sufficient internal unity between the various configurations in this study, and the average variance extraction value is between 0.586 and 0.643. The resulting values are all greater than the standard values required by 0.50, and the measurement model results show that the configuration surfaces of the eight structural equations set up in this study have good reliability and convergence validity.

**4.3. Differential Validity Evaluation of Measurement Models.** After verifying the good consistency between the surfaces of the measurement model, the AVE method is used to test the internal difference validity of each surface in the measurement model. If the square root of the AVE value for each individual facet is greater than the correlation coefficient between the other facets, then the measurement model has good internal difference validity [43]. The square root values of the AVE in the difference validity (Table 6) are represented by diagonal bold numbers, and the other numbers are the correlation coefficients between the other facets in the model. The data show that the square root value of the AVE value of each individual facet is larger than the correlation coefficient value between other facets. It can be seen that there is good difference validity in all eight surfaces of the structural equation model.

TABLE 4: KMO test values.

Variable name	Kaiser–Meyer–Olkin measure of sampling adequacy
Overall reliability	0.903
Perceptual usefulness	0.724
Perceptual ease of use	0.833
Subjective specification	0.887
Behavior attitude	0.824
Perceptual behavior control	0.724
Willingness to use	0.722
Usage behavior	0.727
Subjective well-being	0.822

**4.4. Model Fit and Path Coefficients.** After measuring the internal consistency and difference validity of the surface of the measurement model, the results such as the fit of the structural model and the significance of the study hypothesis are analyzed. The Bootstrap method proposed by Blulen and Stine was used to analyze the suitability of the model [44]. The appropriateness indicators, ideal requirements criteria, and research models are as follows (Table 7): the Bollen–Stine  $X^2$  model has a moderate configuration of 418.64 and a degree of freedom of 6133.55; the normed chi-square ( $X^2/DF$ ) model has a moderate configuration of 1.06; the GFI model has a moderate configuration of 0.93; the AGFI model has a moderate ratio of 0.92; the RMSEA model has a moderate configuration of 0.01; the TLI (NNFI) model has a moderate configuration of 1. The CFI model has a moderate ratio of 1; the NFI model has a moderate ratio of 0.93. According to the ideal requirements of each appropriate index, the model is moderately matched, indicating that the overall fit of the theoretical model assumed in this study is good.

After calculating the reliability, validity, conformity within the structural equation model, the difference validity of each configuration, and the model fitting index, the results show that the theoretical model and the designed measurement table are in line with the standard provisions of the structural equation model, so all the hypotheses proposed in this study can be verified by using the structural equation model. All the research hypotheses in this study are tested using the AMOS 24.0 software, the statistical test of the standardized path coefficients is provided by the structural equation model, and the statistical diagram of the measurement model of this study is finally obtained (Figure 2).



TABLE 5: Convergence validity.

Facets	Topic	Parameter significance estimates				Factor load Std.	Topic reliability SMC	Composition of the reliability CR	Convergence validity AVE
		Unstd.	SE	<i>t</i> value	<i>P</i>				
PU	PU1	1.000				0.805	0.648	0.832	0.623
	PU2	0.872	0.064	13.599	***	0.777	0.604		
	PU3	0.910	0.067	13.655	***	0.785	0.616		
PEU	PEU1	1.000				0.789	0.623	0.878	0.643
	PEU2	1.230	0.078	15.870	***	0.820	0.672		
	PEU3	1.249	0.076	16.362	***	0.824	0.679		
	PEU4	1.106	0.074	14.965	***	0.772	0.596		
SN	SN1	1.000				0.770	0.593	0.894	0.586
	SN2	0.907	0.063	14.426	***	0.746	0.557		
	SN3	0.907	0.064	14.278	***	0.739	0.546		
	SN4	0.983	0.065	15.166	***	0.780	0.608		
	SN5	1.024	0.066	15.409	***	0.791	0.626		
	SN6	0.857	0.058	14.819	***	0.764	0.584		
AT	AT1	1.000				0.802	0.643	0.872	0.630
	AT2	0.987	0.062	15.806	***	0.801	0.642		
	AT3	0.939	0.064	14.703	***	0.751	0.564		
	AT4	0.990	0.061	16.197	***	0.820	0.672		
PBC	PBC1	1.000				0.768	0.590	0.834	0.627
	PBC2	1.078	0.079	13.716	***	0.815	0.664		
	PBC3	1.059	0.078	13.622	***	0.792	0.627		
BI	BI1	1.000				0.765	0.585	0.833	0.624
	BI2	1.044	0.078	13.462	***	0.779	0.607		
	BI3	1.044	0.077	13.645	***	0.825	0.681		
AU	AU1	1.000				0.785	0.616	0.840	0.637
	AU2	1.050	0.075	14.000	***	0.784	0.615		
	AU3	1.070	0.075	14.225	***	0.824	0.679		
SWB	SWB1	1.000				0.791	0.626	0.862	0.609
	SWB2	0.925	0.065	14.212	***	0.750	0.563		
	SWB3	0.980	0.065	15.083	***	0.795	0.632		
	SWB4	1.037	0.070	14.889	***	0.785	0.616		

TABLE 6: Difference validity.

	AVE	SN	PBC	SWB	AU	BI	AT	PEU	PU
SN	0.586	<b>0.766</b>							
PBC	0.627	0.220	<b>0.792</b>						
SWB	0.609	0.392	0.374	<b>0.780</b>					
AU	0.637	0.458	0.490	0.380	<b>0.798</b>				
BI	0.624	0.467	0.582	0.396	0.450	<b>0.790</b>			
AT	0.630	0.386	0.430	0.364	0.450	0.605	<b>0.794</b>		
PEU	0.643	0.101	0.240	0.433	0.495	0.455	0.488	<b>0.802</b>	
PU	0.623	0.174	0.127	0.393	0.392	0.472	0.456	0.368	<b>0.789</b>

From Figure 2 and Table 8, we can see the path coefficient and research hypothesis identification results of this study, and the statistical model diagram and hypothesis result test show that the research assumptions proposed in the ideal model constructed by this study are valid, and all the hypothetical path coefficients in the statistical model diagram of the aging APP use and the happiness measurement model of the young elderly have reached a significance level of more than 5%.

*4.5. Research Conclusions and Prospects.* In this study, under the background of digital empowerment, the aging

app usage behavior and the happiness model of young people in the elderly were constructed by reviewing and summarizing the relevant literature, taking the young people who had used ageing APPS in Changzhutan area as the research object. Taking “subjective well-being of young elderly people” as the dependent variable, the influence of the use of age-appropriate APP in young elderly people on subjective well-being was explained. The study confirmed that the fitting index of the hypothetical model was good and that all hypotheses were within the acceptable range. This study provides an effective reference for effectively improving the subjective

TABLE 7: Model fitting index.

With moderate indicators	Ideal requirements standards	The research model is moderately matched
Bollen–Stine $X^2$	The smaller the better	418.64
DF (degree of freedom)	Bigger is better	6133.55
Normed chi-square ( $X^2/DF$ )	$1 < X^2/DF < 3$	1.06
GFI	$>0.9$	0.93
AGFI	$>0.9$	0.92
RMSEA	$<0.08$	0.01
TLI (NNFI)	$>0.9$	1
CFI	$>0.9$	1
NFI	$>0.9$	0.93

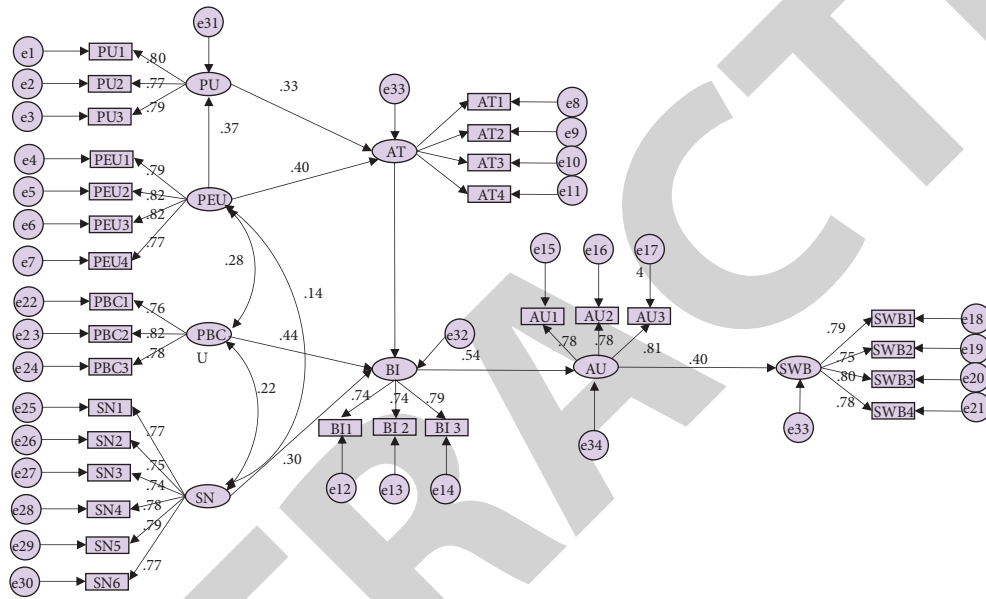


FIGURE 2: Statistical model of ageing APP use and elderly happiness measurement.

TABLE 8: Model path analysis and hypothesis result testing.

Research hypotheses	Suppose the path	Path coefficient	T value	P	Identification results
H1	Usage behavior $\rightarrow$ subjective well-being	0.404	6.422	***	Support
H2	Perceptual usefulness $\rightarrow$ behavior attitude	0.329	5.423	***	Support
H3	Perceptual ease of use $\rightarrow$ behavior attitude	0.398	6.575	***	Support
H4	Perceptual ease of use $\rightarrow$ perceptual usefulness	0.372	5.999	***	Support
H5	Behavior attitude $\rightarrow$ willingness to use	0.425	7.777	***	Support
H6	Willingness to use $\rightarrow$ usage behavior	0.535	8.095	***	Support
H7	Subjective specification $\rightarrow$ willingness to use	0.299	5.775	***	Support
H8	Perceptual behavior control $\rightarrow$ willingness to use	0.438	7.541	***	Support

well-being of young people and the use of age-appropriate APP in young and elderly people in the future.

### 5. Conclusion

By summarizing the results of the above charts, this study can draw the following conclusions:

- (1) The use of age-appropriate APP will have a greater impact on the subjective well-being of young elderly people. It shows that in the era of digital empowerment, the improvement of the subjective happiness of young

people can be achieved by using age-appropriate APPS. The longer the aging APP is used, the stronger the subjective happiness of the young elderly.

- (2) Both perceptual usefulness and perceptual ease of use have a greater impact on behavioral attitudes, and perceptual ease of use significantly affects perceptual usefulness. It shows that in the process of putting into use the ageing APP, the attitude of the young elderly to the use of the ageing APP is significantly affected by the convenience and usefulness of the aging APP software itself. The younger the

elderly feel that the greater the benefit from themselves in the process of using the ageing app software, the more active the young people will be for the use of the ageing APP; at the same time, if the operation and use of the ageing app software make the young elderly feel more convenient, then the younger the elderly will be more positive about the use of the software, and the convenient use of the ageing APP will also affect the usefulness evaluation of the software to a certain extent.

- (3) Behavioral attitudes, subjective norms, and perceptual behavior control all have a great influence on the willingness to use. It shows that the willingness of young people to use age-appropriate APP is mainly significantly affected by these three factors, of which perceptual behavior control has the most significant impact on the willingness of young people to use age-appropriate APP, followed by behavioral attitudes, and the smallest degree of influence is subjective norms.
- (4) The willingness to use has a greater impact on the usage behavior (path coefficient is 0.54). It shows that the stronger the willingness of young people to use age-appropriate apps, the higher the likelihood of their use behavior.

## 6. Discussion and Suggestions

Based on the above research conclusions, the following policy suggestions are put forward for how to improve the subjective well-being of young and elderly people:

- (1) Accelerate the development of smart products for the elderly. In China, although the ageing APP has begun to be applied to the elderly life, the relevant aging software due to its own software design has certain defects, there are still certain operational difficulties for the young elderly, and some ageing APP practicality and ease of use are lacking. To improve the convenience and usefulness of intelligent aging equipment and improve the applicability and comfort of products, it is necessary to pay attention to the personalized needs of young people before the use of ageing APP, the operation experience of aging APP, and feedback information after use, and to use this as a basis for good transformation and upgrading of aging software. Increase the research and development and investment in the field of ageing app in the field of old-age care, and improve the perceptual usefulness and perceptual ease of use of age-appropriate APP, so that young people feel happier in the life of the elderly.
- (2) Narrow disparities in media literacy in young older adults. In today's highly developed digital world, young elderly people are more and more vulnerable to marginalization and are often easily labeled as "outdated," "burdensome," "lonely," and other social labels. Many elderly people cannot enjoy the

dividends brought about by the rapid development of digital technology, and the psychology of "learned helplessness" is more likely to create a digital divide. New technology itself is an important component of social capital. On the one hand, efforts should be made to improve the media literacy skills of the younger elderly, who are able to gain new social capital through their proficiency in the use of digital technology with some possibility. Realizing new social paths among the elderly population can enable them to gain recognition and affirmation among their peer groups and even later generations. On the other hand, the government can actively carry out digital technology education for the young elderly, increase the promotion of age-appropriate policies, improve the initiative of young people to use age-appropriate apps, and enhance the positive attitude of young people to the use of age-appropriate apps. The implementation of a rich form of mobile phone knowledge education activities improves the cognitive level of the young elderly population on the ageing APP and increases the possibility of the young elderly contact with the use of ageing APP software.

- (3) Strengthen intergenerational technical support for the elderly. Intergenerational technical support can help the elderly solve general operational difficulties when using smartphones, solve the worries of the elderly at the technical level, and effectively alleviate the technical anxiety of young people about smartphones. In the past, the traditional, one-way, passive intergenerational "digital feedback" has begun to gradually transform into the technical dominance of the offspring in today's rapid digital development. Through continuous new technologies, the offspring feedback the parents, build a bridge between the children and the young and the elderly in the network life, promote the parents to integrate into the digitalization more smoothly, help the elderly to better use the age-appropriate APP, and let the elderly feel happier to meet the arrival of the age-appropriate era [45].
- (4) Broaden the social support network for the elderly, and attach importance to the interaction between the young elderly and the surrounding environment. Whether young people choose to use intelligent aging products depends largely on the influence of family members and friends around them. Therefore, it is necessary to vigorously exert the positive interaction mechanism between the people around them and the environment and promote the care of peer groups, which will help enhance their subjective normative role in ageing APPS. Strengthen the effective supply of social resources, strengthen the pertinence of network social information services, and play a role in the form of information transmission. At present, the promotion of age-appropriate APP is still in its infancy, and more enterprises and organizations should have a better understanding of the special needs of the elderly. Positive social impact will also be

an important breakthrough in the development and popularization of smart old-age care, encouraging young elderly people to use age-appropriate APP use behavior, and enhancing the sense of gain and happiness of young elderly people in the process of old-age care.

There are also some deficiencies in this study such as this study only analyzes the young and elderly in the Changzhan area of Hunan Province and fails to fully take into account the individual differences caused by regional economic, cultural, and other related factors. Compared with other research fields, the “Internet + pension” model is still in its infancy in China, and how to find better indicators in the structural equation model to more intuitively and effectively express the connotation of potential variables needs further research. The measurement of subjective well-being in young and elderly people mainly depends on the self-evaluation of the study subjects, and the evaluation results have certain limitations. Each study subject may have a different understanding of the same problem and may come to the opposite point of view. In subsequent studies, the problem scale and volume should be further improved. With the rapid development of Internet technology and information technology, the use of age-appropriate APP may have a new impact on the happiness of young and elderly people, and at the same time, due to data limitations, there may be some endogenous problems in this study.

## Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

## Conflicts of Interest

The authors declare that they have no conflicts of interest.

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