Hindawi
Mobile Information Systems
Volume 2022, Article ID 2760131, 7 pages
https://doi.org/10.1155/2022/2760131

Research Article

Research on Augmented Reality College English Listening and Speaking Teaching Mode Supported by Wearable Technology

Na Li

Shool of Foreign Languages, Weinan Normal University, Weinan 714000, Shaanxi, China

Correspondence should be addressed to Na Li; hn2916@wfd.edu.ug

Received 1 July 2022; Revised 5 August 2022; Accepted 17 August 2022; Published 11 October 2022

Academic Editor: Yajuan Tang

Copyright © 2022 Na Li. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

With the rapid development of Internet technology, two new terms, such as wearable devices and AR, have begun to appear in front of people. AR technology refers to things that are difficult to experience in reality. It appears in front of people's eyes in space and time, and these things actually exist in the real world. The development process of AR technology shows that the boundary between teachers and students is gradually disappearing. If the school purchases a wearable device, they can use this device for university English listening and speaking teaching. This article will discuss the advanced equipment of AR supported by wearable technology applied in the field of university English teaching and complete the discussion and analysis of the following aspects: first, analyze the current situation of the application of AR technology in education and collect some domestic research cases outside, finding the problems. Then, this article introduces the theoretical basis and technical support for the education application of wearable AR technology, and a total of 110 students in the experimental class and control class of a university's English department are interviewed and investigated. Finally, this article applies wearable AR technology to the university. In the English listening and speaking teaching model, we use questionnaire surveys, interviews, and quasi-experimental research methods to understand the teaching model of wearable devices. We used AR technology in English listening and speaking learning and discussed the application of mobile AR technology in education and found that wearable AR technology is of great help to college English listening and speaking teaching.

1. Introduction

1.1. Background. At present, the teaching mode of college English listening and speaking is divorced from real life and away from its context, so that students can only passively accept it. With the rapid development of Internet technology, AR technology has slowly entered people's lives. AR is a technology that calculates the position and angle of a camera in real time and adds the corresponding image. The goal of this technology is to display and interact with virtual worlds on the screen. However, AR technology has not yet been fully popularized in the fields of education and teaching, so in this article, we will discuss how AR technology will make new major breakthroughs in the field of education.

1.2. Significance. The process of educational information development is constantly advancing, and more and more new technologies and tools are being introduced into classroom teaching to solve the problems existing in traditional classrooms. The continuous innovation of educational concepts and teaching methods has increased the demand for new technologies in the design of modern classroom learning activities. The classroom environment supported by technology has become a trend in educational research and development. Therefore, the exploratory significance of wearable AR technology to the teaching model of English listening and speaking is divided into two aspects: academic value and application value.

1.3. Related Work. Foreign research on AR technology in daily teaching started relatively early, and a series of research results have been achieved. A team of scientists headed by Akcayir et al. has explored the effects of using AR in scientific laboratories and adopted standards. The experimental pretest and post-test control group design of AR technology

enhances the development of college students' laboratory skills and helps them establish a positive attitude towards the physics laboratory [1], but their research has not been applied to daily teaching management mode. So experts like Jaramillo and Solano began to study using YouTube English music videos and AR mobile technology as a teaching resource to improve the listening and speaking skills of college students [2], but they only studied English for other languages, such as English as a popular language, and they have not carried out any related research and reports. Although Roesner et al. proposed that AR systems would bring potential security issues that should be resolved before the system is widely used [3], most people in the education sector believe that AR systems should be more widely used. These studies have guiding significance for virtual reality in college English audio-visual teaching, but the research on AR technology is not deep enough.

1.4. Innovation. Mobile AR devices have been so successful, in part, because AR marketing only requires the use of a smartphone. Wearable AR technology for university English listening and speaking teaching can not only recognize images and superimpose information but also provide students with a more realistic learning environment so that they have an immersive feeling. The teaching mode can not only stimulate students' interest in learning and bring them into the historical and cultural connotations of English but also allows students to travel through thousands of years of cultural history and have face-to-face language exchanges with ancient English scholars, thereby improving the learning efficiency. This kind of university English listening and speaking teaching mode is unprecedented. AR technology can take content off the screen and put it back in the book, making it entertaining and interactive.

2. Research Methods of AR for University English Listening and Speaking Education Model under Wearable Technology

2.1. Interview Method. Use the interview method to understand college students' feelings about using wearable AR devices in the learning process and the benefits and disadvantages of wearable technology-based AR for university English listening and speaking [4].

2.2. Questionnaire Survey. The general differences among students in different regions and genders were investigated through questionnaires. Use questionnaire research methods to understand students' acceptance of AR technology and AR equipment requirements, and use questionnaire survey methods to collect students' technical acceptance of wearable device AR technology based on AR models [5, 6]. AR education superimposes virtual information into the real world through AR technology, making the original boring education and teaching knowledge points into vivid images, enhancing students' interest in things, and attracting them to actively participate in teaching.

2.3. Quasi-Experimental Research Method. Quasi-experimental research refers to a research method that uses the original group to conduct experimental treatment in a relatively natural situation without randomly arranging subjects. Use quasi-experimental research to apply mobile AR technology to the learning of university English listening and speaking courses. After the completion of the experiment, according to Davis's technology acceptance model, the influence of wearable device AR technology on learning English listening and speaking was confirmed, and its problems were confirmed [7, 8]. Davis' acceptance model is a usage intention and attitude of users through perceived usefulness and perceived ease of use in the presence of external variables. The overall technical model is shown in Figure 1.

2.4. Mathematical Statistics. Mathematical statistics is a branch of mathematics divided into descriptive statistics and inferential statistics. It is based on probability theory and studies the statistical regularity of a large number of random phenomena.

(1) Levene's test of homogeneity of variance

$$S = \frac{1}{NWJ} \frac{\sum_{m=1}^{i} Bm\left(Xm-\right)}{i-1}. \tag{1}$$

(2) T-test

$$\mathrm{t} = \frac{-\mu}{\sigma \mathrm{n}/\sqrt{\mathrm{m}-1}}. \tag{2}$$

(3) Synthesis of sample difference

$$\theta x = \sqrt{\frac{\sum_{j=1}^{k}\left(mj\,\theta j\right) + \sum_{j=1}^{k} mj\,(-Yx)}{m1+m2+\ldots+mk}}. \tag{3}$$

(4) Sample size estimation

$$\mathrm{m} = \left(\frac{\mathrm{t}(\alpha/2)\bullet S}{\mathrm{d}}\right). \tag{4}$$

(5) Confidence interval of the overall mean

$$\left[-\frac{Z(\alpha/2)\bullet\sigma}{\sqrt{\mathrm{n}}}, +\frac{Z(\alpha/2)\bullet\sigma}{\sqrt{\mathrm{n}}}\right]. \tag{5}$$

(6) Product difference correlation coefficient

$$Z\mathrm{MN} = \frac{\sum \mathrm{MiNi}—1/\mathrm{x}\left(\sum \mathrm{Mi}\right)\left(\sum \mathrm{Ni}\right)}{\sqrt{Mi-1/x\left(\sum Mi\right)}\sqrt{Ni-1/x\left(\sum \mathrm{Ni}\right)}}. \tag{6}$$

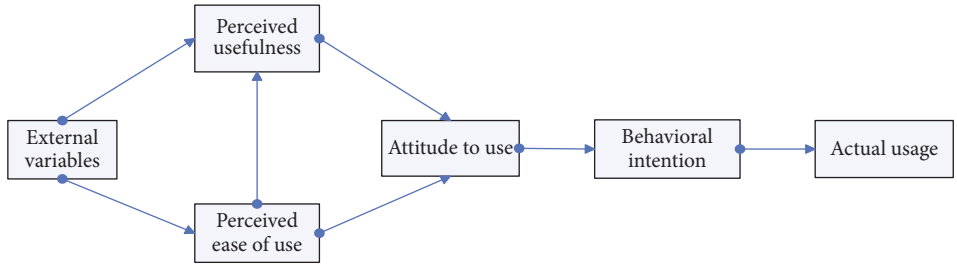

Figure 1: Davis' acceptance model.

3. Experiments Related to the Influence of AR Technology on College English Listening and Speaking Classes Supported by Wearable Technology

3.1. Test Subject. In order to verify the learning effect of the college English listening and speaking teaching based on wearable technology and AR technology in this study, we selected two classes in the first year of the English department of a university, one as an experimental class, and the second as a control class, with 55 students in each class. These students have the basic operating ability of the software. The English courses are also at the same level [9, 10]. Before the experiment, first, conduct a test with students in two classes; the test content is to understand the English content put on the player and express it fluently [11]. In traditional classrooms, teachers teach new knowledge on the podium, and students listen carefully, take notes, answer questions, and complete paperwork assigned by the teachers on time after class (as shown in Figure 2).

3.2. Implementation Process. AR listening and speaking teaching is adopted for experimental class teaching, which is a learning method corresponding to traditional receiving learning [12]. With students as the main body of learning, students can make their own decisions and achieve learning goals through relatively independent analysis, exploration, practice, inquiry, and student creation [13, 14]. As shown in Figure 3, learners learn independently through AR English listening and speaking teaching, which promotes learning in the AR environment and helps improve classroom learning efficiency. The improvement of learning efficiency is the key to implementing quality education [15]. Teachers and students can communicate on the Internet in a timely manner, and problems can be solved through mutual discussions within the group; if they encounter problems that cannot be solved, they will conduct intergroup discussions and ask teachers for advice.

Traditional teaching methods such as blackboard writing design and practice, lesson preparation and transformation, and so on that use multimedia cannot achieve the desired effect and may even diminish the prestige of the teacher. In the implementation, the first class of the English Department adopts the teaching method of AR education application and teacher guidance under the guidance of the teacher. In the second class of the English Department, the same teacher used traditional teaching methods to teach and did not use wearable AR devices. AR education has the characteristics of simulation and interaction, which can present abstract and obscure knowledge in a more vivid, intuitive, and comprehensive way and enhance students' sense of substitution with immersive experience. The study time is 2 weeks with 5 lessons per week.

4. Experimental Results of the Inquiry into the Teaching Mode of English Listening and Speaking in AR Universities Supported by Wearable Technology

4.1. Results of the Interview Method. When asked whether the students in class 1 find the current class more interesting than before, most of them expressed affirmation and believed that by using wearable AR devices, the difficulty of listening can be reduced by enhancing the rendering of the pictures, and they all said they are also willing to speak English, which greatly enhances students' interest in English learning. We think it will be more interesting after using these resources in class [16, 17]. When asked if they were confident in their ability to learn better and achieve better results in the test, most of the interviewed students expressed confidence that they could get better results in the test, which shows that wearable AR devices can listen to English well and have a good teaching effect.

4.2. Questionnaire Results. The questionnaire was entrusted to the first-year counselor of the English Department. A total of 110 questionnaires were sent out, and 110 were returned. A total of 5 questionnaires were excluded from blank and incomplete questionnaires, and 105 valid questionnaires were received. The interview has strong flexibility, using a relatively complex interview outline; the standardization of the questionnaire survey process; the scope of the survey is wide; and the efficiency is high. Our survey subjects included students from different parts of the country and different genders in the experimental class and the control class. There are also some differences in the understanding of virtual reality and AR technology. From the statistical data, there are general differences in AR technology. Out of the number of boys and girls who "do not understand," one-third of boys and girls choose to "know a little bit," and only a small number of people choose "very well" (as shown in Figure 4). Considering that they are students majoring in English

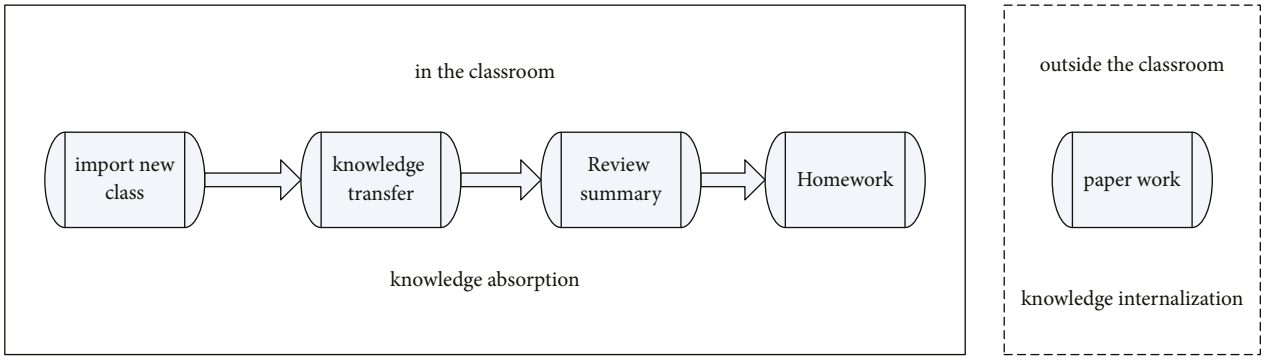

Figure 2: Traditional teaching.

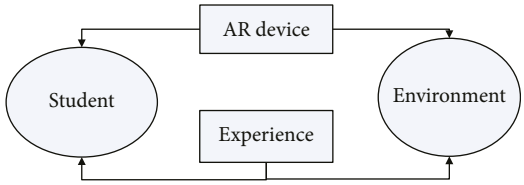

Figure 3: Listening and speaking teaching method based on AR technology.

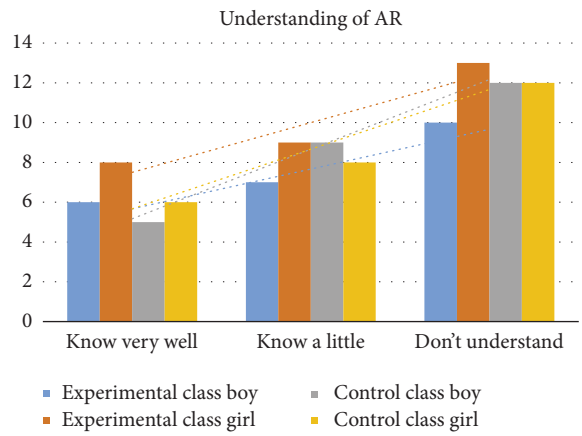

Figure 4: The level of English students' understanding of AR technology.

education, we can think that among college students, fewer people understand AR technology. It can be seen that the popularity of AR technology in the field of education in our country is far from enough [18]. It can be seen from these surveys that few people understand AR technology, which shows that the application of AR technology to English education is very rare.

In addition, we also investigated the deficiencies of the use of wearable technology AR devices for university English listening and speaking teaching from the experimental class students. The results of the survey are shown in Figure 5. There are three main aspects: AR equipment is too bulky, AR equipment is complicated to use, and frequent use of AR equipment will cause students' vision loss [19]. In future technological development, product developers will definitely optimize these problems and bring us more brand-new experiences.

4.3. Result of Quasi-Experimental Research Method

4.3.1. Statistics and Analysis of Pretest and Post-Test Data. Collect and analyze the data in the pretest and post-test experiments. First of all, with the help of the school's educational administration information system, the final English listening and speaking test scores of the students in two classes were obtained in the first semester of admission. There was no significant difference in English proficiency in the control class before the experiment. The experimental class uses the wearable AR technology teaching mode, while the control class uses the traditional university English listening and speaking teaching modes. Both the two classes took part in the university's English listening and speaking tests after the completion of the study course. The listening and speaking test results before and after the experiment are shown in Tables 1 and 2.

After the experiment, the average score change curve of the listening and speaking levels of the experimental group and the control group is shown in the following Figure 6:

At that time, it was about two weeks before the two classes applied their respective teaching modes. The listening and speaking tests contain questions such as listening, interpreting, and written translation and are authoritative and professional [20]. Judging from the changes in the two balance scores before and after the test, the changes in the test group's scores were more obvious than those in the control group, and the results were authoritative and professional. Therefore, the results of the university's English listening and speaking tests are post-test data to analyze the difference in English proficiency between two classes after different English listening and speaking teaching modes. At the same time, we conducted a review of the experimental class students. The learners conducted a questionnaire survey on the receiving data model of the teaching mode of wearable AR technology, and the statistical results are shown in Table 3.

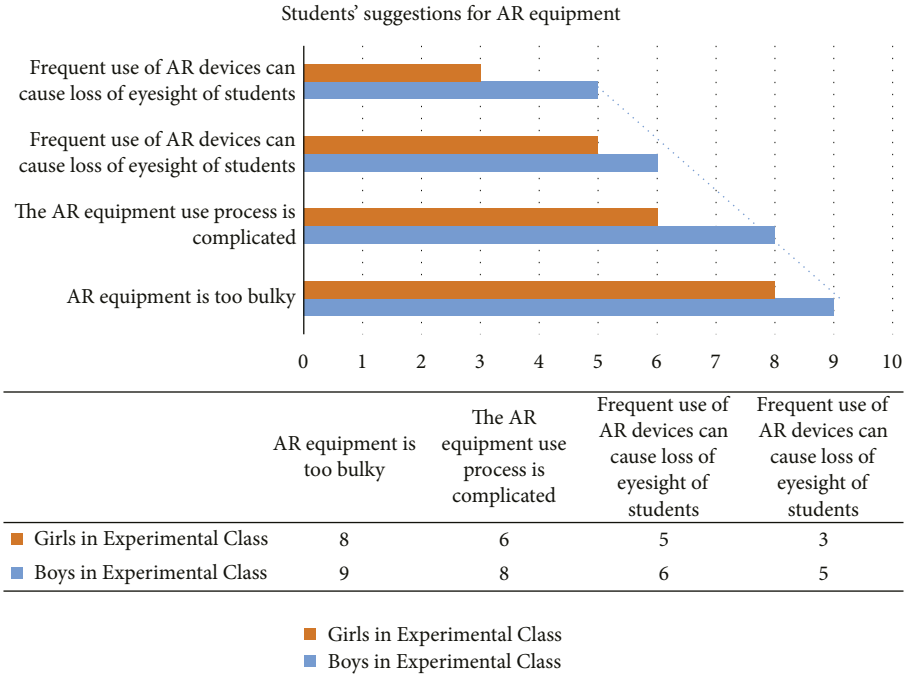

Figure 5: Students' suggestions for wearable technology AR devices.

Table 1: Pre-experiment test levels.

Group	Test group	Control group
Listening section average score	46	44
Average score for the oral part	39	42
Average score	85	86

Table 2: Postexperiment test levels.

Group	Test group	Control group
Listening section average score	48	46
Average score for the oral part	42	43
Average score	90	89

Figure 6: Comparison chart of changes in the average scores of the two groups before and after the test.

Analysis of the data shows that the evaluation scores of the number of people who choose perceived usefulness learning are relatively high. Perceived usefulness refers to learners who have a certain understanding of AR technology after using wearable AR devices. The average score for the two questions is 4.5. The highest score is that AR technology can promote English listening and speaking learning, and the lowest score is that we have more confidence in the final English listening and speaking tests after using the wearable AR device. In the statistics of the behavioral intention dimension data, we can find that the option with the lowest score is "I will use other AR devices in the future". Since our wearable AR device still has some shortcomings, we can obviously find that the scores on the option of "hope to continue to use the wearable AR device for English listening and speaking learning" are low, but after the wearable use of AR and the understanding of AR technology by the interviewees, they showed great concern about the application of AR technology in other courses.

(1) Pretest. Through the use of SPSS software, the first semester and end of the first semester English listening and speaking test scores (converted into a hundred-point system) of two classes are statistically analyzed .

① Homogeneity of Variance Test (as shown in Table 4).

② *T*-test with equal mean (as shown in Table 5).

(2) Post-Test. The SPSS software is used to analyze the English listening and speaking scores (converted into a hundred-point system) after the two-week study course of the experimental group and the control group, that is, the post-test (as shown in Table 6).

According to the above independent *t*-test sample data, sng is 0.045, which is less than 0.05, indicating that there is a significant difference between the English listening and speaking scores of the two classes. The average score of the experimental class is better than that of the control class.

Table 3: Technical acceptance model statistics.

Dimension	Serial number	Number of people	The average score
Perceived usefulness	A1	33	4.2
	A2	22	4.8
Perceived ease of use	B1	14	4.1
	B2	23	3.6
Behavioral intention	C1	18	3.4
	C2	34	3.7
Use behavior	D1	4	2.5

Table 4: Levene's test of homogeneity of variance.

		F	Sng
Grades	Assuming equal variances	0.458	0.486
	Assuming that the variances are not equal		

Table 5: T-test for equal means.

		t	df	Sng	Mean error	Standard error difference	95% difference confidence interval	
							Lower limit	Upper limit
Pretest score	Assuming equal variances	−0.245	59	0.745	−0.4416	1.4852	−3.145	2.345
	Assuming that the variances are not equal	−0.236	53.124	0.745	−0.4416	1.4852	−3.145	2.345

Table 6: Independent sample t test and Levene's test for post-test results.

		Post-test score variance equation Levene's test		T-test for the mean equation						
		F	Sng	t	df	Sng	Mean error	Standard error difference	95% difference confidence interval	
									Lower limit	Upper limit
Post-test score	Assuming equal variances	2.584	0.135	−0.245	59	0.045	3.5471	1.6578	−3.145	6.3245
	Assuming that the variances are not equal			−0.236	56	0.045	3.5471	1.6578	−3.145	8.3355

Therefore, the use of wearable AR devices can improve students' overall English listening and speaking skills and improve learning efficiency.

5. Conclusions

There are still many problems with our research. First, we only studied the teaching of English listening and speaking with wearable device AR technology. Does this technology have the same effect on reading and writing as it does on teaching in other languages? Second, this wearable AR device also has many shortcomings, and it is still necessary to wait for R&D personnel to improve the device. It is believed that as more demand based on AR technology continues to emerge, this technology will surely mature and its application in education and teaching will also be popularized. It can be predicted that in the next 10 years, educational applications based on AR technology will reach a new height.

Data Availability

This article does not cover data research. No data were used to support this study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

This work was supported by the Shaanxi Province Education Science "14th Five-Year Plan" 2021 Annual Project.

References

[1] M. Akcayir, G. Akcayir, H. M. Pektas, and M. A Ocak, "Augmented reality in science laboratories: the effects of

augmented reality on university students' laboratory skills and attitudes toward science laboratories," *Computers in Human Behavior*, vol. 57, no. apr, pp. 334–342, 2016.

[2] M. Jaramillo and L. Solano, "Youtube English music videos as educational resource to teach vocabulary and improve the listening and speaking skills[J]," pp. 103–106, 2019, https://zenodo.org/record/3283788#.YywsxD1BzIU.

[3] F. Roesner, T. Kohno, and D. Molnar, "Security and privacy for augmented reality systems," *Communications of the ACM*, vol. 57, no. 4, pp. 88–96, 2014.

[4] E. Marchand, H. Uchiyama, and F. Spindler, "Pose estimation for augmented reality: a hands-on survey," *IEEE Transactions on Visualization and Computer Graphics*, vol. 22, no. 12, pp. 2633–2651, 2016.

[5] I. Masaki, "Erratum to: reduced health-related quality of life among English college students with visual impairment[J]," *BioPsychoSocial Medicine*, vol. 10, no. 1, pp. 1–7, 2016.

[6] Y. Kokubo, K. Kisara, Y. Yokoyama et al., "Habitual dietary protein intake affects body iron status in Japanese female college rhythmic gymnasts: a follow-up study," *SpringerPlus*, vol. 5, no. 1, p. 862, 2016.

[7] J. M. T. Van Uem, T. Isaacs, A. Lewin et al., "A viewpoint on wearable technology-enabled measurement of wellbeing and health-related quality of life in Parkinson's disease," *Journal of Parkinson's Disease*, vol. 6, no. 2, pp. 279–287, 2016.

[8] J. M. Jakicic, K. K. Davis, R. J. Rogers et al., "Effect of wearable technology combined with a lifestyle intervention on long-term weight loss: the IDEA randomized clinical trial[J]," *JAMA*, vol. 316, no. 11, pp. 1161–1171, 2016.

[9] A. Daniel and H. Hashimoto, "A blinded assessment of video quality in wearable technology for telementoring in open surgery: the Google Glass experience[J]," *Surgical Endoscopy*, vol. 30, no. 1, pp. 372–378, 2016.

[10] J. Wu, H. Li, S. Cheng, and Z. Lin, "The promising future of healthcare services: when big data analytics meets wearable technology," *Information & Management*, vol. 53, no. 8, pp. 1020–1033, 2016.

[11] M. A. Hentschel, M. L. Haaksma, and T. van de Belt, "Wearable technology for the elderly: u," *European geriatric medicine*, vol. 7, no. 5, pp. 399–401, 2016.

[12] L. D. Ellingson, J. D. Meyer, and D. B. Cook, "Wearable technology reduces prolonged bouts of sedentary behavior," *Translational Journal of the American College of Sports Medicine*, vol. 1, no. 2, pp. 10–17, 2016.

[13] R. Lindberg, J. Seo, and T. H. Laine, "Enhancing physical education with exergames and wearable technology," *IEEE Transactions on Learning Technologies*, vol. 9, no. 4, pp. 328–341, 2016.

[14] M. H. Iqbal, A. Aydin, O. Brunckhorst, P. Dasgupta, and K. Ahmed, "A review of wearable technology in medicine," *Journal of the Royal Society of Medicine*, vol. 109, no. 10, pp. 372–380, 2016.

[15] S. L. Halson, J. M. Peake, and J. P. Sullivan, "Wearable technology for athletes: information overload and pseudo-science?[J]," *International Journal of Sports Physiology and Performance*, vol. 11, no. 6, pp. 705-706, 2016.

[16] A. V. Shelgikar, P. F. Anderson, and M. R. Stephens, "Sleep tracking, wearable technology, and opportunities for research and clinical care," *Chest*, vol. 150, no. 3, pp. 732–743, 2016.

[17] J. A. Bunn, J. W. Navalta, C. J. Fountaine, and J. D. Reece, *International Journal of Exercise Science*, vol. 11, no. 7, pp. 503–515, 2018.

[18] S. Nemati, M. M. Ghassemi, V. Ambai et al. in *Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society. IEEE Engineering in Medicine and Biology Society. Annual International Conference*, vol. 2016, pp. 3394–3397, Mexico, North America, November 2016.

[19] J. Blumenthal, A. Wilkinson, and M. Chignell, "Physiotherapists' and physiotherapy students' perspectives on the use of mobile or wearable technology in their practice," *Physiotherapie Canada*, vol. 70, no. 3, pp. 251–261, 2018.

[20] I. Awolusi, E. Marks, and M. Hallowell, "Wearable technology for personalized construction safety monitoring and trending: review of applicable devices," *Automation in Construction*, vol. 85, no. JAN, pp. 96–106, 2018.