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Özgün Araştırma

Fizyoterapi Öğrencilerinin Sanal Gerçeklik ve Teknolojiye Bakış Açıları: Eğitim Yılı ve Kişilik Tipleri Farklılıkları

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Özet

Amaç: Bu çalışmanın amacı, fizyoterapi öğrencilerinde sanal gerçeklik (SG) farkındalığı ve teknolojiye hazır bulunuşluk düzeyinin eğitim yılları ve kişilik tiplerine göre farklılık gösterip göstermediğini incelemek ve SG farkındalığı ile teknolojiye hazır bulunuşluk arasındaki ilişkiyi araştırmaktır.
Gereç ve Yöntem: Katılımcılar, gönüllü olarak katılmayı kabul eden 18-30 yaş arası 279 fizyoterapi öğrencisinden oluşuyordu. Veri toplama süreci, sosyo-demografik bilgileri, Teknoloji Hazır Bulunuşluğu İndeksini, Holland tipolojisine dayalı bir kişilik anketini ve bir SG farkındalığı bölümünü içeriyordu.
Bulgular: Analiz, farklı eğitim dönemleri arasında teknoloji hazır bulunuşluğu ve SG farkındalığında önemli bir fark bulunmazken ($p>0,05$), kişilik tiplerine göre önemli farklılıklar gözlemlendiğini ortaya koydu ($p<0,05$). Özellikle, girişimci ve araştırmacı tipler, sosyal ve geleneksel tiplere kıyasla daha yüksek düzeyde teknoloji hazır bulunuşluğu ve SG farkındalığı sergiledi ($p<0,05$). Ayrıca, teknoloji hazır bulunuşluğu ile SG farkındalığı puanları arasında orta düzeyde pozitif bir korelasyon bulundu ($r= 0,424$, $p<0,001$).
Sonuç: Çalışma, eğitim dönemlerinden bağımsız olarak fizyoterapi öğrencileri arasında SG farkındalığını ve teknoloji hazır bulunuşluğunu etkilemede kişilik tiplerinin önemini vurgulamaktadır. Bu sonuçlar, fizyoterapi eğitiminde teknolojinin etkili kullanımını teşvik etmek ve öğrencilerin bu alandaki bilgi ve becerilerini geliştirmek için uygun eğitim stratejilerinin geliştirilebileceğini göstermektedir. Eğitim stratejileri geliştirilirken kişilik tipleri dikkate alınabilir.

Anahtar kelimeler: *sanal gerçeklik, öğrenciler, kişilik, fizik tedavi, eğitim*

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Original Research

The Perspectives of Physiotherapy Students About Virtual Reality and Technology: Educational Year and Personality Types Differences

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Abstract

Objectives: This study aimed to examine whether virtual reality (VR) awareness and technology readiness levels in physiotherapy students differ according to their education years and personality types and to investigate the relationship between VR awareness and technology readiness.
Materials and Methods: Participants included 279 physiotherapy students aged 18-30 who voluntarily consented to participate. Data collection process included socio-demographic information, the Technology Readiness Index, a personality questionnaire based on Holland's typology, and a VR awareness section.
Results: Analysis revealed that while no significant differences were found in technology readiness and VR awareness across different educational years ($p>0.05$), significant differences were observed based on personality types ($p<0.05$). Specifically, enterprising and investigative types exhibited higher levels of technology readiness and VR awareness than social and conventional ones ($p<0.05$). Moreover, a moderately positive correlation was found between technology readiness and VR awareness scores ($r=0.424$, $p<0.001$).
Conclusion: The study highlights the significance of personality types in influencing VR awareness and technology readiness among physiotherapy students, regardless of their educational year. These results suggest that appropriate educational strategies could be developed to promote the effective use of technology in physiotherapy education and to enhance students' knowledge and skills in this field. The personality types could be considered when developing educational strategies.

Keywords: *virtual reality, students, personality, physical therapy, education*

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Introduction

Advancing technology has always been a significant part of human life. Specifically, health-related needs have led to the development of numerous technologies from the past to the present. The World Health Organization defines technology in healthcare as the application of systems, vaccines, drugs, devices, and developed capabilities through organized information to improve the quality of life and address a health problem (Saigí-Rubió et al., 2022). Virtual reality (VR) technology is among the important technologies and approaches that will impact the healthcare field (Ammatuna & Changcoco, 2017).

VR is a computer-based simulation system that allows users to be inside a virtual environment with three-dimensional images and videos composed of multiple sensory inputs, creating a sense of reality for the user (Malloy & Milling, 2010). The integration of VR into healthcare services has been purported to enhance patients' morale and motivation, potentially reducing the duration of the treatment process (Lányi, 2006). VR is utilized for various purposes, such as supporting the training of healthcare professionals, surgical simulations, and treatment methods. Additionally, in the field of physiotherapy and rehabilitation, VR can be used in clinical settings alongside exercises. There are numerous studies indicating that VR reduces pain in musculoskeletal system problems like chronic neck and back pain, post-mastectomy surgery, oncological rehabilitation, and neuropathic pain conditions, leading to improvements in individuals' well-being (Ahern et al., 2020; Pandrangi et al., 2022; Wittkopf et al., 2020).

The progression of technology tends to arouse curiosity and draw the attention of certain individuals, prompting them to closely follow its developments. Conversely, it may fail to capture the attention of others. Consequently, a range of external factors have been demonstrated to indirectly impact behaviors associated with the acceptance of technology (Agarwal & Prasad, 1999). One of these external factors is personality type. Personality types can affect an individual's tendency toward technology (Lam et al., 2008). Consequently, the personality types of physiotherapy students can also influence their curiosity and awareness of technology, potentially creating differences in their perspectives on virtual reality. Additionally, as students progress through their educational years, their levels of knowledge may increase, which could also lead to differences in their perspectives on virtual reality. A study indicated that to increase VR technology use in healthcare, focusing on behavior change among stakeholders like caregivers, patients, and administrators is essential (Kouijzer et al., 2023).

In today's digital age, where VR and other technological methods are increasingly prevalent in rehabilitation practices, it is critically important for physiotherapy students to gain

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awareness and in-depth knowledge of these technologies (Ramadan & Altamimi, 2024). Technology readiness, defined as an individual's willingness and ability to adopt and effectively use new technologies (Parasuraman & Colby, 2015), plays a key role in this process. These tools can potentially enhance treatment processes, boost patient motivation, and positively impact treatment outcomes. Therefore, fostering high technology readiness among physiotherapy students can contribute to the successful integration of digital health solutions into clinical practice.

In line with this information, this study has been designed to assess the perspective of physiotherapy students on VR. The hypotheses of the study are as follows: 1) Physiotherapy students' awareness of virtual reality and technology readiness is different based on educational years, 2) Physiotherapy students' awareness of virtual reality and technology readiness is different based on personality types, 3) The technology readiness of physiotherapy students is related to their perspectives on virtual reality applications.

Materials and Methods

Study Design

This cross sectional study was conducted at Hacettepe University Faculty of Physical Therapy and Rehabilitation. Ethical approval was obtained from the Hacettepe University Non-Interventional Research Ethics Committee (Approval Number: SBA 23/340). Participants were informed and obtained consent forms prior to the study. Participants were recruited through advertisements on social media platforms, including Instagram, Facebook, and X. The advertisements were shared in physiotherapy student groups and university-related pages. Interested individuals who met the inclusion criteria were invited to complete the online survey via the provided link. Participation was entirely voluntary and anonymous.

Participants

Inclusion criteria were consenting to participate voluntarily, being a student in the physiotherapy and rehabilitation department, and being between the ages of 18 and 30. Exclusion criteria included not being fluent in speaking and understanding Turkish. A total of 279 physiotherapy students who met the inclusion criteria were included in the study.

Measurements

The assessment parameters consisted of four sections: socio-demographic information, Technology Readiness Index, Personality Questionnaire, and the virtual reality awareness section, consisting of questions we created ourselves.

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Socio-Demographic Information

The participants' demographic data, including age, gender, body mass index (BMI), and educational year, were recorded. In addition, the participants were asked about their use of smartphones and smartwatches, whether they had previously taken a technology course, and how they keep up with technological developments.

The Technology Readiness Index

This index was developed by Parasuraman, consists of 16 statements and is scored on a 5-point Likert scale. The scale ranges from 1 = "strongly disagree" to 5 = "strongly agree." (optimism, innovativeness, discomfort, insecurity) (Bakırtaş & Akkaş, 2020; Parasuraman & Colby, 2015; Tınmaz, 2019).

The Personality Questionnaire

This questionnaire was developed within the framework of Holland's (2001) Typology and Environment Model. This questionnaire is based on Holland's six personality types (Realistic, Investigative, Artistic, Social, Enterprising, Conventional) outlined. Participants were asked to identify which personality type they aligned with by providing descriptions of these personality types (Holland et al., 1994).

Virtual Reality Awareness Section

This section includes 15 questions we created to assess students' knowledge level about virtual reality applications. The questions were scored as follows: 0 = "no", 1 = "undecided", 2 = "yes." A total of 30 points can be obtained, with an increase in points indicating an increase in virtual reality awareness.

Additionally, five questions were asked to evaluate participants' perspectives on virtual reality:

1) I believe that patients can tolerate virtual reality.
2) I believe that virtual reality may have side effects (nausea, headache) in patients.
3) I believe that the use of virtual reality will not be appropriate for some patient populations.
4) I believe that virtual reality will meet the treatment expectations of patients.
5) I believe that technological problems will be encountered when using virtual reality applications.

Statistical Analysis

Statistical analyses were conducted using IBM SPSS Statistics 21 (Statistical Package for the Social Sciences). The normality of the data distribution was assessed using the Shapiro-Wilk test. Since the data met the normality assumptions, parametric tests were applied for group

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comparisons. Descriptive analyses presented minimum and maximum values for numerical data and the mean ± standard deviation (X±SD). For categorical data, the number (n) and percentage (%) values were calculated. A one-way ANOVA test was used to determine statistically significant differences between the educational year and personality type groups. The Bonferroni correction was applied to adjust for post-hoc group comparisons according to personality types. A p-value less than 0.0033 (0.05/15) was considered statistically significant for post-hoc group comparisons. The relationship between the Technology Readiness Index and Virtual Reality Awareness was analyzed using the Pearson Correlation Test. A correlation coefficient between two variables is considered to have a very weak correlation (0.00–< 0.20), weak correlation (0.20–0.39), moderate correlation (0.40–0.59), strong correlation (0.60–0.79), and very strong correlation (>0.80) (Papageorgiou, 2022).

A post-hoc power analysis was conducted to evaluate the adequacy of the sample size for detecting differences in VR awareness scores among personality type groups. The analysis was performed using the means, standard deviations, and sample sizes of each group, applying Bonferroni correction for multiple comparisons (p=0.0033). The analysis included all six personality type groups: Researcher (n = 90), Realistic (n = 72), Artistic (n = 26), Social (n = 50), Enterprising (n = 75), and Conventional (n = 26). The means and standard deviations used in the analysis.

The post-hoc power analysis indicated that the study had a statistical power of 0.99, suggesting a very high probability of detecting true differences among the groups. This result confirms that the sample size was sufficient to detect significant differences with a low risk of Type II error.

Results

Socio-Demographic Characteristics of Participants

The participants' age, BMI, gender, educational years, and personality types are presented in Table 1. Furthermore, all participants have smartphones. The smartwatch use rate is 73.8%. The students who had previously taken courses related to technology were 154 (51.8%). The majority of participants (93.2%, n = 260) reported that they follow technological developments.

Results of Participants According to Educational Years

When participants were compared according to their educational years regarding the Technology Readiness Index, no statistical difference was found between the groups (p > 0.05).

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Similarly, the VR awareness score was not different among the educational year groups ($p > 0.05$) (Table 2).

Table 1. Socio-Demographic Characteristics of Participants

Variables	**(N=279)** **X ± SD**	
Age	21.11±1.66	
BMI	22.64±3.69	
	n (%)	
Gender		
Female	227 (81.4)	
Male	52 (18.6)	
Year		
1st year	58 (19.5)	
2nd year	66 (22.2)	
3rd year	66 (22.2)	
4th year	89 (36.1)	
Personality types		
Researcher	90 (32.2)	
Realistic	72 (25.8)	
Artistic	26 (9.30)	
Social	50 (17.9)	
Enterprising	75 (26.9)	
Conventional	26 (9.30)	
	Yes	**No**
Smartphone use	279 (100)	0 (0.0)
Smartwatch use	206 (73.8)	73 (26.2)
Previously had a technology course	154 (51.8)	125 (48.2)
Follow technological developments	260 (93.2)	12 (6.8)

X: Mean, SD: Standard Deviation, BMI: Body Mass Index

Table 2. The Comparison of TRI and VR Awareness Scores of Participants According to Educational Years and Personality Types

	TRI **X ± SD**	**VR awareness score** **X ± SD**
Year		
1st year	50.52 ± 10.11	24.53 ± 4.07
2nd year	50.24 ± 10.76	24.06 ± 4.07
3rd year	51.42 ± 9.21	24.33 ± 4.01
4th year	52.69 ± 9.17	24.47 ± 3.45
p	0.404*	0.896*
Personality type		
Researcher	52.47± 7.85	25.54 ± 3.02
Realistic	49.44 ± 11.38	24.00 ± 3.60
Artistic	52.65 ± 6.07	24.85 ± 3.14
Social	48.78 ± 10.71	22.53 ± 4.24
Enterprising	55.31 ± 8.77	21.72 ± 1.72
Conventional	11.29 ± 2.17	22.85 ± 5.64
p	**0.032***	**<0.001***

TRI: Technology Readiness Index, VR: Virtual Reality, X: Mean, SD: Standard Deviation, *One-way ANOVA test was used for group comparisons.

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Results of Participants According to Personality Types

When analyzing the Technology Readiness Index according to personality types, the Technology Readiness Index was different among personality types (p = 0.032) (Table 2). However, post-hoc comparisons indicated no difference between personality type groups regarding the Technology Readiness Index (Table 3).

Table 3. Post-hoc Comparisons of Personality Type Groups in Terms of TRI

TRI	Researcher (n=90)	Realistic (n=72)	Artistic (n=26)	Social (n=50)	Enterprising (n=75)	Conventional (n=26)
Investigative		p=0.841	p=1.0	p=0.517	p=1.0	p=1.0
Realistic			p=1.0	p=1.0	p=0.133	p=1.0
Artistic				p=1.0	p=1.0	p=1.0
Social					p=0.085	p=1.0
Enterprising						p=1.0
Conventional						

TRI: Technology Readiness Index, *Bonferroni correction was applied for post-hoc group comparisons.

In addition to that, VR awareness score was different between the groups (p = <0.001) (Table 2). When post-hoc results were investigated, the VR awareness score of the researcher type group was different from the social and conventional groups (respectively, p = <0.001, p = 0.001). Similarly, the enterprising type was different from social and conventional groups (respectively, p = 0.002, p = 0.002) (Table 4).

Table 4. Post-hoc Comparisons of Personality Type Groups in Terms of VR Awareness Score

VR Awareness	Researcher (n=90)	Realistic (n=72)	Artistic (n=26)	Social (n=50)	Enterprising (n=75)	Conventional (n=26)
Investigative		p=0.154	p=1.0	**p=<0.001**	p=1.0	**p=0.001**
Realistic			p=1.0	p=0.488	p=0.272	p=1.0
Artistic				p=0.141	p=1.0	p=0.716
Social					**p=0.002**	p=1.0
Enterprising						**p=0.002**
Conventional						

VR: Virtual Reality, *Bonferroni correction was applied for multiple comparisons (p = 0.05/15 = 0.0033). A p-value less than 0.0033 was considered statistically significant.

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The Relationship Between The TRI and VR Awareness

The Pearson Correlation Test indicated that there was a moderate correlation between the TRI and VR awareness score ($r = 0.424$, $p < 0.001$) (Table 5).

Table 5. The Relationship Between the TRI and VR Awareness Scores

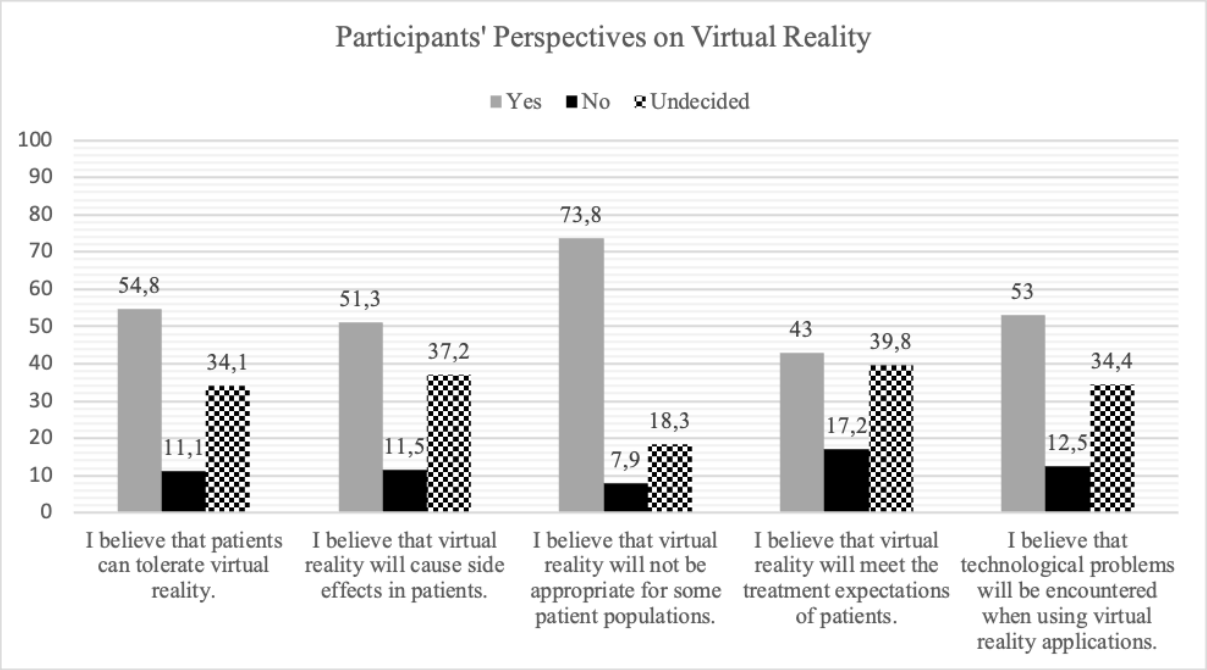
	VR awareness score	
TRI	r= 0.424	p= <0.001*

TRI: Technology Readiness Index, VR: Virtual Reality, *Pearson Correlation test was used.

Participants' Perspectives on VR

Most participants (n = 152, 54.8%) answered “yes” to the question "I believe that patients can tolerate virtual reality. Most participants (n = 143, 51.3%) answered “yes” to the question "I believe that virtual reality may have side effects in patients. Most participants (n = 205, 73.8%) answered “yes” to the question “I believe that the use of virtual reality will not be appropriate for some patient populations.” Most participants (n= 119, 43 %) answered “yes” to the question “I believe that virtual reality will meet the treatment expectations of patients.” Most participants (n=147, 53 %) answered “yes” to the question, “I believe that technological problems will be encountered when using virtual reality applications.” (Figure 1).

Figure 1. Participants' Perspectives on Virtual Reality



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Discussion and Conclusion

This study aimed to examine how educational years and personality types influence VR awareness and technology readiness among physiotherapy students and investigate the relationship between VR awareness and technology readiness. The results of the study indicated that VR awareness and technology readiness among physiotherapy students were similar in educational years. Also, VR awareness and technology readiness were higher among the enterprising and investigative types than among the conventional and social types.

Students' relationship with technology has become very diverse and complex today. As a generation growing up in a digitized world, students are generally proficient in technology and accept it as an integral part of their daily lives (Røpke et al., 2010). In our study, the fact that educational years have similar levels of technology readiness might be due to individuals having spent their childhood and adolescence in the same digital era and being exposed to the same technological developments. All individuals included in the study had smartphones, the vast majority had smartwatches, and 93.2% followed technological developments. This situation also supports our opinion. In a study on smartphone usage among young people in XXX, the results revealed that 83.1% of the participants had been using smartphones for more than three years (Kuyucu, 2017). Another study indicated that nearly all adolescents aged 12–19 years (98%) own a mobile phone, most of which (97%) are smartphones (Haug et al., 2015). A study conducted in Turkey stated that the average age at which people start using smartphones is 12.34 years (Bülbül & Tunç, 2018). These studies prove how early children growing up in the new digital age are introduced to technology. Accordingly, the first hypothesis was rejected, which proposed that physiotherapy students' awareness of VR and technology readiness differ based on educational years.

When the participants' technology readiness and VR awareness scores were analyzed according to their personality types, the researcher and entreprising types had higher technology readiness and VR awareness scores compared to the social and conventional types. Considering enterprising and researcher types tended to be extraverted (Fritzsche et al., 2002), they may tend to innovate, be willing to explore and use new technology, and be more curious. This innate curiosity and analytical skill set drive them to engage deeply with new technologies like VR, making them more comfortable and proficient with technological advancements. On the other hand, the conventional personality type strongly prefers activities that involve clear, organized, and systematic handling of data and tends to avoid exploratory or unstructured activities. This preference might make them less inclined to experiment with new and evolving

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technologies like VR. Social types prioritize human interaction and relationships over technological engagement. Their primary interest in activities that involve direct manipulation of others to inform, train, or develop may limit their focus on technology, resulting in lower VR awareness and readiness (Amichai-Hamburger, 2002). Sönmez et al. (2015) indicated that personality type has an effect on technology readiness. The entreprising type was associated with innovativeness, whereas the social type was not associated with innovativeness (Sönmez & Akgül, 2015). In summary, the higher technology readiness and VR awareness scores among researcher and enterprising types can be attributed to their inherent curiosity, analytical skills, proactivity, and goal-oriented nature, while the lower scores in social and conventional types are likely due to their focus on human interaction, preference for structured activities, and aversion to change. Accordingly, the second hypothesis was accepted, which suggests that awareness of VR and technology readiness vary according to personality types.

The participants' readiness levels for technology had a moderate relationship with their awareness levels of VR. One possible reason for this result is that readiness for technology encompasses attitudes and skills related to a wide range of technologies, not just awareness of VR. Thus, awareness levels of VR may not be directly associated with general readiness for technology. Additionally, the relatively new and not fully understood nature of VR applications used in rehabilitation may have influenced awareness levels (Öztürk & Sondaş, 2020). Therefore, the third hypothesis was partially accepted, which stated that technology readiness is related to students' perspectives on VR applications.

The findings of this study highlight that physiotherapy students with higher awareness of VR and greater technology readiness may have an advantage in adapting to emerging digital health technologies. As VR-based rehabilitation and assessment tools become more integrated into clinical practice, students who are familiar with these technologies could demonstrate enhanced adaptability and competence in patient care.

Moreover, VR-based education has been shown to improve clinical decision-making, motor learning, and patient interaction skills by providing immersive, risk-free training environments. Future curricula could benefit from incorporating VR-based simulations to enhance students’ academic development and professional readiness.

Considering the increasing role of VR in telerehabilitation and remote patient monitoring, physiotherapy students with a solid understanding of VR applications may also be better prepared to implement innovative, patient-centered care models. Therefore, fostering VR awareness and technology readiness in physiotherapy education could be crucial for developing

competent professionals equipped to meet the demands of the evolving healthcare landscape. Our study has several limitations. Firstly, we assessed and scored virtual reality awareness using self-prepared questions. The validity and reliability of these questions have not been tested or confirmed in the literature, which may negatively impact the results' validity. Secondly, the limited sample size may affect the generalizability of the results. Future research could include studies that use newly developed and validated scales and involve larger and more diverse sample groups.

In conclusion, the study revealed that the awareness of VR and technology readiness among physiotherapy students does not vary significantly across different educational years. However, personality types play a crucial role in these aspects. The students identified as enterprising and investigative exhibited higher levels of VR awareness and technology readiness compared to those categorized as conventional and social types. These findings suggest that personality types could be considered when developing educational strategies aimed at enhancing VR awareness and technology readiness among physiotherapy students. Future research should continue to explore these relationships and consider integrating personality assessments into educational planning.

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Conflict of Interest

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

Ethical Approval

Ethical approval for this study was obtained from the Hacettepe University Non-Interventional Research Ethics Committee (Approval Number: SBA 23/340).

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