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Comparison of the Osteoporosis Knowledge Levels of Physiotherapy Students Pre-post Awareness Training: A Randomized Controlled Trial

Fizyoterapi Öğrencilerinin Farkındalık Eğitimi Öncesi ve Sonrası Osteoporoz Bilgi Düzeylerinin Karşılaştırılması: Randomize Kontrollü Çalışma

Bengisu Tüfekçi[1], Tuğba Birben Kurt[2], Ayşe Nur Şekeroğlu[3]

[1]Gaziantep İslam Science and Technology University Vocational School of Health Services, Department of Physiotherapy Program, Gaziantep, Türkiye
[2]Recep Tayyip Erdoğan University Güneysu Vocational School of Physical Therapy and Rehabilitation, Department of Women's Health and Rehabilitation, Rize, Türkiye
[3]Osmaniye Korkut Ata University Vocational School of Health Services, Department of Therapy and Rehabilitation, Osmaniye, Türkiye

Abstract

Objective: This research seeks to answer the question of whether education on osteoporosis is more effective when delivered via video conferencing or through informational brochures.
Materials and Methods: The sample of the study consisted of 223 physiotherapy and rehabilitation students. Students were divided into two groups (video group, brochure group) by stratified randomization method according to their achievement levels. Osteoporosis awareness training was conducted through an online video conferencing system and using informative brochures. The osteoporosis knowledge test-revised (R-OKT) was used to assess the level of osteoporosis knowledge and awareness.
Results: While there was no significant difference between the brochure and video training groups in terms of R-OKT scale nutrition, exercise and total knowledge scores ($p>0.05$), it was observed that the post-training scores increased significantly in both groups compared to the pre-education scores ($z>8.5$, $p<0.001$). Statistically significant differences were found between grade levels in post-education nutrition ($\chi^2=52.222$, $p<0.001$), exercise ($\chi^2=56.488$, $p<0.001$), and total knowledge scores ($\chi^2=62.863$, $p<0.001$). Pairwise comparisons revealed that 2nd-year students had significantly higher scores than all other grade levels ($p<0.05$). Positive and statistically significant relationships were found between the students' grade point average and the scores of the R-OKT subscales both before and after the training ($r=0.157$-0.302, $p<0.05$).
Conclusion: Current study showed that video education methods were as effective as traditional printed materials in increasing the level of knowledge and awareness about osteoporosis and that the effect of education may vary depending on class levels. The findings underscore the importance of providing early and well-structured osteoporosis education for future healthcare professionals, which is essential for the development of more effective preventive health strategies.
Keywords: Osteoporosis, awareness, health education strategies, video-based learning

Öz

Amaç: Bu araştırma, osteoporozla ilgili eğitimin video konferans yoluyla mı yoksa bilgilendirici broşürler aracılığıyla mı daha etkili olduğu sorusuna yanıt aramaktadır.
Gereç ve Yöntem: Çalışmanın örneklemi 223 fizyoterapi ve rehabilitasyon öğrencisinden oluşmuştur. Öğrenciler, başarı düzeylerine göre tabakalı randomizasyon yöntemi ile iki gruba (video grubu, broşür grubu) ayrılmıştır. Osteoporoz farkındalık eğitimi, çevrimiçi video konferans sistemi ve bilgilendirici broşürler kullanılarak gerçekleştirilmiştir. Osteoporoz bilgi testi-revize (R-OKT) ölçeği kullanılarak osteoporoz bilgi ve farkındalık düzeyi değerlendirilmiştir.
Bulgular: Broşür ve video eğitim grupları arasında R-OKT ölçeği beslenme, egzersiz ve toplam bilgi puanları açısından anlamlı bir fark bulunmazken ($p>0,05$), eğitim sonrası puanların her iki grupta da eğitim öncesi puanlara göre anlamlı olarak arttığı gözlemlenmiştir ($z>8,5$, $p<0,001$). Eğitim sonrası beslenme ($\chi^2=52,222$, $p<0,001$), egzersiz ($\chi^2=56,488$, $p<0,001$) ve toplam bilgi puanları ($\chi^2=62,863$, $p<0,001$) açısından sınıflar arasında anlamlı farklılık saptanmıştır. Yapılan ikili karşılaştırmalar sonucunda, 2. sınıf öğrencilerinin puanlarının diğer tüm sınıf

Corresponding Author/Sorumlu Yazar: Bengisu Tüfekçi PT, PhD Gaziantep İslam Science and Technology University Vocational School of Health Services, Department of Physiotherapy Program, Gaziantep, Türkiye
E-mail: tufekci.bengisu@gmail.com **ORCID ID:** orcid.org/0000-0002-3042-6083
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seviyelerine göre anlamlı düzeyde daha yüksek olduğu belirlenmiştir (p<0,05). Öğrencilerin not ortalamaları ile eğitim öncesi ve sonrası R-OKT alt ölçeklerinin puanları arasında pozitif ve istatistiksel olarak anlamlı ilişkiler bulundu (r=0,157-0,302, p<0,05).
Sonuç: Çalışmamız, video eğitim yöntemlerinin osteoporoz hakkında bilgi ve farkındalık düzeyini artırmada geleneksel basılı materyaller kadar etkili olduğunu ve eğitimin etkisinin sınıf düzeyine göre değişebileceğini göstermiştir. Sonuçlar, gelecekteki sağlık profesyonelleri için erken ve yapılandırılmış osteoporoz eğitiminin önemini vurgulamakta ve bu eğitimin, daha etkili önleyici sağlık stratejilerinin geliştirilmesine katkı sağlayacak nitelikte olduğunu göstermektedir.
Anahtar kelimeler: Osteoporoz, farkındalık, sağlık eğitimi stratejileri, video tabanlı öğrenme

Introduction

Osteoporosis (OP) is a systemic disease characterized by low bone density and deteriorated microarchitecture of bone tissue, leading to an increased fragility of the skeletal system (1). Often referred to as the "silent epidemic of the 21st century", OP typically progresses without symptoms until it manifests through fractures (2). In 2019, it was estimated that 25.5 million women and 6.6 million men in the European Union, the United Kingdom, and Switzerland were affected by OP. Additionally, 4.3 million patients have a history of osteoporotic fractures (3). By 2046, it is predicted that the rate of hospital admissions due to osteoporotic fractures will increase by 150% (4). Osteoporotic fractures significantly reduce patients' quality of life, leading to dependence in daily activities (5). In addition to causing deformities, they also result in serious mortality and morbidity (6). In this context, OP represents a significant public health issue (7).

The etiology of OP involves both genetic and environmental factors. A family history of OP, low body mass index (BMI), calcium and vitamin D deficiencies, excessive caffeine consumption, insufficient sunlight exposure, alcohol and tobacco use, sedentary lifestyle, and menopause are among the risk factors (8). The increasing level of OP with advancing age diminishes quality of life. Physical dysfunctions due to OP have negative effects both sensorially and psychologically (9).

In order to prevent OP, bone tissue should be strengthened and bone health should be protected at an early age. Evaluation of risk factors in the early period and awareness-raising studies in this regard are very important for stopping the development of OP, preventing its progression, and avoiding fractures that may arise from OP (10).

There are studies in the international literature that assess the level of knowledge and awareness of OP in various segments of society (11-13). However, there has been no study in the literature examining the impact of different types of education on the awareness levels of physiotherapy and rehabilitation students. The fundamental aim of our study is to determine the knowledge level and awareness of physiotherapy and rehabilitation students regarding OP, who will play significant roles in every stage of OP treatment when they begin practicing their profession. This research specifically seeks to answer the question of whether education on OP is more effective when delivered via video conferencing or through informational brochures. This study aims to identify methods that will contribute to a more effective learning process for students regarding OP.

Materials and Methods

Type of Research and Ethical Considerations

Our study was randomized and experimental type, and ethical approval was obtained from Osmaniye Korkut Ata University Health Sciences Research Ethics Committee (no: E.177950, date: 23.05.2024). Participants who voluntarily agreed to participate and gave written informed consent were included in the study.

Population and Sample

The population of the study consisted of students studying at Recep Tayyip Erdoğan University, Güneysu School of Physical Therapy and Rehabilitation (n=270). The sample size was not calculated, and it was aimed to reach the entire population. Reaching 70% of the population was accepted as sufficient sample size for the study (14). The sample of the study consisted of 223 (82.6%) physical therapy and rehabilitation students who accepted to participate in the study and completed the scale form completely in May 2024 after ethical approval was obtained. Although the study aimed to reach the entire population, potential selection bias due to voluntary participation was minimized through stratified randomization and a high response rate (82.6%).

Data Collection Tools

Students were divided into groups by stratified randomization method according to their achievement levels [those with grade point average (GPA) >2, those with GPA between 2-3, and those with GPA >3]. Two groups of students were randomized using the sealed envelope method, with equal numbers from each stratum. Both groups received training on OP. OP education was given to the first group [video group (VG)] online via video conferencing system. The online training video used in our study was 15 minutes long. This video content was created by Dr. Physiotherapist, one of the researchers in our study, with verbal and visual expression accompanied by a power point presentation. The second group [brochure group (BG)] was educated by distributing a brochure containing OP content prepared by the same Dr. Physiotherapist who was also involved in our study. The content of the video and the brochure was prepared to be identical in terms of the scope of information. The "personal information form' was used to record the socio-demographic characteristics of the students, and OP knowledge test-revised (R-OKT)" was used to determine the level of OP knowledge and awareness. Before the training, the two groups answered the R-OKT at the same time but in different classes under the supervision of an instructor. Immediately after

answering the R-OKT, the VG students were made to watch a 15-minute OP education video. After the completion of the video conference, the R-OKT was answered by the students for the second time without being removed from the classroom. In the BG, the information brochure was distributed immediately after answering the R-OKT for the first time and they were asked to read it for 15 minutes. After the brochure training, the BG answered the R-OKT for the second time without being removed from the classroom. Participating students were unaware that they would answer the R-OKT scale for the second time at the end of the study. The answers obtained from the study were evaluated in a single blinded manner by another Dr. physiotherapist who took part in our study.

Data were collected online using Google forms. The reason why this online method was preferred in collecting the data was to ensure that the participants responded impartially and without being influenced because the researcher conducting the study was a Asst. Prof. at the university of the participants to whom the questionnaire would be applied, and in addition, to prevent paper waste (15). Each participant was allowed to respond only once; no personal information was collected, and all responses were recorded anonymously. Participants were informed to complete the form voluntarily and attentively. The pre- and post-tests were administered on the same day to minimize environmental influences, ensure the standardization of educational delivery, and prevent information transfer between groups. To enhance data quality and minimize methodological limitations, the Google Forms platform was configured to allow only one response per participant, and all questions were set as mandatory to prevent missing data and duplicate submissions. Participants were required to answer each question before proceeding to the next, in order to reduce inattentive or careless responses. The survey link was distributed exclusively to the target population through restricted access. Participants were clearly informed about the scientific purpose of the study and were explicitly told that participation was entirely voluntary and that they would face no consequences should they choose not to participate. The importance of providing accurate and thoughtful responses for scientific integrity was also emphasized.

Personal Information Form

It consists of 9 questions in which gender, age, class, smoking, presence of chronic diseases, knowledge of regular physical activity, height, body weight, BMI of physical characteristics, and GPA to determine the academic achievement level of the students were questioned.

Osteoporosis Knowledge Test (R-OKT)

The OKT scale was first developed by Kim et al. (16) in 1991 to include 24 multiple-choice questions to measure the level of knowledge about OP. The scale includes questions related to exercise, activity level and diet to prevent OP. The Turkish validity and reliability of the revised form of the OKT (R-OKT), which was revised by Gendler et al. (17) and in which the number of questions was increased to 32, was performed by Şimşir Atalay et al. (18). R-OKT was used in our study. In the R-OKT, questions 1-11 ask about OP risk factors. The answers consist of "high probability of OP", "low probability of OP", "not related to the development of OP" and "don't know". The answers "It is not related to the development of OP" or "I do not know" are considered incorrect and 0 points are given, while the answers "It is likely to have OP" or "it is unlikely to have OP" are considered correct and 1 point is given. The other questions contain 4 optional answers, and 1 point is awarded when the correct answer is marked. The R-OKT has 2 subgroups: The nutrition subgroup contains 26 questions (1-11 and 18-32), and the exercise subgroup contains 20 questions (1-17 and 30-32). These two subgroups have 14 questions in common (1-11 and 30-32). This is taken into account in the total score, and the total score is between 0-32. A high score indicates a good level of OP knowledge (17).

Statistical Analysis

Shapiro-Wilk test was used to evaluate whether the variables in the study conformed to normal distribution. Mean ± standard deviation and median (minimum-maximum) values were given in the descriptive statistics of the variables.

Mann-Whitney U test was used to compare pre-education (pre-e) R-OKT score, post-education (post-e) R-OKT score, age, height, weight, BMI, and GPA values according to brochure-video grouping.

Wilcoxon signed-rank test was used to examine whether the R-OKT scores in the study differed at the measurement times (pre-post education).

Cross tabulations were created; number (n), percentage (%) and chi-square (χ^2) test statistics were given for the comparison of categorical variables according to brochure-video grouping.

Kruskal-Wallis non-parametric analysis of variance was used to compare the R-OKT scores of individuals according to the class of education. Bonferroni correction was made for pairwise comparisons, and the results of the analyses were presented.

Spearman non-parametric correlation coefficient was used in the correlation analysis between R-OKT scores and grade and GPA.

For statistical analyses and calculations, IBM SPSS Statistics 21.0 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) and MS-Excel 2007 programs were used. Statistical significance level was accepted as $p<0.05$.

Results

It was determined that the gender, grade level, smoking status, and physical activity levels of students in the Brochure and VGs were similar ($p>0.05$). The mean age of students in the BG was significantly higher than that of students in the VG ($z=2.067$, $p=0.039$). However, the groups were similar in terms of height, weight, BMI, and GPA ($p>0.05$) (Table 1).

No significant difference was found between the pre-e and post-e R-OKT nutrition scores of students in the Brochure and VGs ($p>0.05$). However, in both groups, post-e nutrition scores

Table 1. Distribution of socio-demographic and physical characteristics by group				
	Brochure group (n=107)	**Video group (n=116)**	**Test statistic**	
Socio-demographic characteristics	**n (%)**	**n (%)**	**χ^2**	**p**
Gender				
Female	88 (82.2)	97 (83.6)	χ^2=0.075	0.785
Male	19 (17.8)	19 (16.4)		
Academic year				
1st year	23 (21.5)	31 (26.7)	χ^2=2.239	0.524
2nd year	31 (29.0)	39 (33.6)		
3rd year	28 (26.2)	24 (20.7)		
4th year	25 (23.3)	22 (19.0)		
Smoking				
Yes	23 (21.5)	25 (21.6)	χ^2=0.001	0.992
No	84 (78.5)	91 (78.4)		
Physical activity				
Yes	30 (28.0)	30 (25.9)	χ^2=0.134	0.714
No	77 (72.0)	86 (74.1)		
Physical characteristics	**Mean ± SD median (min-max)**	**Mean ± SD median (min-max)**	**Z**	**p**
Age (years)	21.40±1.77	20.96±1.49	z=2.067	0.039*
	21.0 (18-29)	21.0 (18-25)		
Height (m)	1.65±0.09	1.66±0.08	z=0.310	0.756
	1.64 (1.45-1.88)	1.65 (1.53-2.01)		
Weight (kg)	64.63±14.14	64.57±16.12	z=0.444	0.657
	62.0 (34-130)	61.0 (44-140)		
BMI (kg/m²)	23.57±4.31	23.34±4.36	z=0.476	0.634
	22.9 (15.2-39.2)	22.6 (17.3-38.8)		
GPA	2.53±0.42	2.45±0.45	z=1.641	0.101
	2.56 (1.0-3.47)	2.50 (1.0-3.43)		

n: Number of individuals, %: Percentage; χ^2: Chi-square test, m: Meter, kg: Kilogram, SD: Standard deviation, BMI: Body mass index, GPA: Grade point average, Min: Minimum, Max: Maximum, z: Mann-Whitney U test, p<0.05

increased significantly compared to pre-e scores (*z>8.9, p<0.001). This finding indicates that both educational methods positively influenced students' nutrition knowledge (Table 2, Figure 1).

Similarly, the pre-e and post-e R-OKT exercise scores of students in the Brochure and VGs were statistically similar (p>0.05). However, in both groups, post-e scores increased significantly compared to pre-e scores (*z>8.5, p<0.001). This result suggests that both educational methods were effective in improving students' exercise knowledge, with no significant difference in the degree of improvement between the groups (Table 2, Figure 1). A similar pattern was observed for total R-OKT scores. Although no statistically significant difference was found between the groups (p>0.05), post-e scores in both groups increased significantly compared to pre-e scores (*z>8.9, p<0.001) (Table 2, Figure 1).

Students' pre-e nutrition scores were similar across grade levels (p>0.05). However, post-e nutrition scores showed statistically significant differences between grade levels (χ^2=52.222, p<0.001). Pairwise comparisons revealed a significant difference between the post-e data of 2nd-year students and all other grade levels (p<0.05). This finding indicates that 2nd-year students achieved higher nutrition scores post-education, demonstrating greater improvement in nutrition knowledge. Additionally, pairwise comparisons of post-e data between 1st and 4th years showed that upper-grade students had significantly higher knowledge (p<0.05) (Table 3).

A significant difference was found in pre-e exercise scores across grade levels (χ^2=21.985, p<0.001). Pairwise comparisons indicated that 4th-year students' exercise scores were significantly higher than those of 1st- and 2nd-year students (p<0.05). Post-e exercise scores also showed significant differences between

Table 2. Comparison of pre-education (PT) and post-education (PT) R-OKT scores between and within groups

	Mean ± SD	Median (min-max)	Mean ± SD	Median (min-max)	p (group)	
R-OKT nutrition						
Pre-e	15.00±2.83	15.0 (7-21)	14.12±3.23	14.0 (3-21)	z**=1.765	0.077
Post-e	20.77±2.57	21.0 (11-25)	20.34±2.64	20.0 (13-26)	z**=1.458	0.145
P (time)	*z=8.926; p<0.001		*z=9.135; p<0.001			
R-OKT exercise						
Pre-e	11.77±2.45	12.0 (6-17)	11.05±2.68	11.0 (3-16)	z**=1.608	0.108
Post-e	16.16±2.33	16.0 (8-20)	15.61±2.38	16.0 (9-20)	z**=1.940	0.052
P (time)	*z=8.508; p<0.001		*z=8.896; p<0.001			
R-OKT total score						
Pre-e	17.88±3.19	18.0 (9-25)	16.90±3.63	17.0 (6-25)	z**=1.714	0.086
Post-e	25.03±3.34	25.0 (14-31)	24.30±3.63	24.0 (14-32)	z**=1.712	0.087
P (time)	*z=8.907; p<0.001		*z=9.099; p<0.001			

R-OKT: Osteoporosis knowledge test-revised, Pre-e: Pre-education, Post-e: Post-education, SD: Standard deviation, Min: Minimum, Max: Maximum, *: Wilcoxon signed-rank test, **: Mann-Whitney U test

grade levels (χ^2=56.488, p<0.001). Pairwise comparisons revealed that 2nd-year students' exercise scores were significantly higher than those of all other grade levels (p<0.05). This suggests that 2nd-year students had higher exercise knowledge both pre-education (except compared to 4th years) and post-education compared to other grades (Table 3).

No statistically significant difference was found in pre-e total scores across grade levels (p>0.05). However, post-e total scores showed significant differences between grade levels (χ^2=62.863, p<0.001). Post-hoc pairwise comparisons (Mann-Whitney U test with Bonferroni correction) revealed that 2nd-year students' total scores were significantly higher than those of all other grade levels (p<0.05). This finding suggests that 2nd-year students exhibited higher overall performance post-education compared to other grades (Table 3).

Analysis of pre-e data revealed a positive and significant correlation between grade level and students' overall academic achievement (GPA) and exercise subscale scores (r=0.387, p<0.001 and r=0.297, p<0.001, respectively). This suggests that as grade level increases, both academic achievement and exercise knowledge improve. Similarly, a positive but weaker correlation was found between grade level and nutrition and total scores (r=0.177, p=0.008 and r=0.173, p=0.010, respectively), indicating a positive relationship between grade level and students' nutrition knowledge and total R-OKT scores (Table 4).

A low-level, positive correlation was observed between GPA and nutrition subscale scores (r=0.172, p=0.010), suggesting that as academic achievement increases, nutrition knowledge also improves. Similarly, moderate (r=0.302, p<0.001) and low-level (r=0.220, p=0.001) positive correlations were found between GPA and exercise and total scores, respectively. These results indicate that as GPA increases, students' nutrition and exercise knowledge, as well as their overall OP knowledge, also improve (Table 4).

Strong, positive linear relationships were identified between students' nutrition and exercise scores and their total scores. A high-level, statistically significant positive correlation was found between nutrition and exercise scores (r=0.748, p<0.001), indicating a strong relationship between nutrition knowledge and physical activity knowledge. Similarly, a very high-level, statistically significant positive correlation was observed between nutrition scores and total scores (r=0.939, p<0.001), suggesting that nutrition knowledge significantly impacts the total OP knowledge score. A very high-level, statistically significant positive correlation was also found between exercise scores and total scores (r=0.827, p<0.001), supporting the significant role of exercise knowledge in increasing the total OP knowledge score (Table 4).

A very weak, positive, and statistically significant relationship was detected between GPA and both nutrition and total scores (r=0.158, p=0.018; r=0.157, p=0.019).

Post-e scores showed strong, positive linear relationships. As GPA increased, the R-OKT total score, i.e., OP knowledge level, also increased. A very high-level, statistically significant positive correlation was found between nutrition scores and both exercise scores (r=0.823, p<0.001) and total scores (r=0.954, p<0.001), indicating that post-e nutrition knowledge directly affects both exercise knowledge and overall OP knowledge. Similarly, a very high-level, statistically significant positive correlation was observed between exercise scores and total scores (r=0.915, p<0.001), suggesting that exercise knowledge significantly impacts the total OP knowledge level and interacts synergistically with nutrition knowledge (Table 4).

Figure 1. Osteoporosis knowledge test-revised

Table 3. Evaluation of R-OKT scores by grade level

Grade	Nutrition subscale		Exercise subscale		Total score	
	Pre-e Mean ± SD median (min-max)	Post-e Mean ± SD median (min-max)	Pre-e Mean ± SD median (min-max)	Post-e Mean ± SD median (min-max)	Pre-e Mean ± SD median (min-max)	Post-e Mean ± SD median (min-max)
1st year	13.74±3.23	19.20±2.21	10.67±2.68	14.91±2.02	16.43±3.64	22.59±2.74
	14.0 (3-21)	19.0 (13-24)	10.5 (5-17)	15.0 (9-19)	17.0 (6-25)	22.0 (14-28)
2nd year	14.37±3.14	22.24±2.54	10.80±2.61	17.50±2.31	17.20±3.64	27.23±3.48
	15.0 (6-19)	23.0 (15-26)	11.0 (3-16)	18.0 (10-20)	18.0 (8-24)	28.0 (16-32)
3rd year	14.73±2.99	19.65±2.71	11.75±2.14	14.81±2.33	17.73±3.19	23.59±3.37
	15.0 (7-21)	20.0 (11-25)	12.0 (6-16)	15.0 (8-19)	18.0 (10-25)	24.0 (14-30)
4th year	15.53±2.62	20.55±1.43	12.72±2.39	15.74±1.37	18.30±3.01	24.34±1.87
	15.0 (10-20)	21.0 (17-23)	13.0 (6-17)	16.0 (12-19)	18.0 (12-24)	25.0 (20-28)
Test statistic	χ^2=7.690 p=0.053	χ^2=52.222 p<0.001*	χ^2=21.895 p<0.001*	χ^2=56.488 p<0.001*	χ^2=7.110 p=0.068	χ^2=62.863 p<0.001*

R-OKT: Osteoporosis knowledge test-revised, Pre-e: Pre-education; Post-e: Post-education, SD: Standard deviation, Min: Minimum, Max: Maximum, χ^2: Kruskal-Wallis test; p<0.05

Table 4. Correlation between grade level, GPA, and pre-education and post-education R-OKT scores (n=223)

Pre-e						
		Grade	**GPA**	**Nutrition**	**Exercise**	**Total**
Grade	r					
	p					
GPA	r	0.387				
	p	<0.001*				
Nutrition	r	0.177	0.172			
	p	0.008*	0.010*			
Exercise	r	0.297	0.302	0.748		
	p	<0.001*	<0.001*	<0.001*		
Total	r	0.173	0.220	0.939	0.827	
	p	0.010*	0.001*	<0.001*	<0.001*	
Post-e						
Grade	r					
	p					
GPA	r	0.387				
	p	<0.001*				
Nutrition	r	0.057	0.158			
	p	0.396	0.018*			
Exercise	r	-0.029	0.127	0.823		
	p	0.664	0.058	<0.001*		
Total	r	0.054	0.157	0.954	0.915	
	p	0.419	0.019*	<0.001*	<0.001*	

R-OKT: Osteoporosis knowledge test-revised, GPA: Grade point average, Pre-e: Pre-education; Post-e: Post-education, r: Spearman correlation coefficient, *: Statistically significant correlation (p<0.05)

Discussion

Since OP is an important public health problem that is preventable and manageable, recent studies have emphasized the importance of increasing individuals' awareness and knowledge levels about OP (19-21). However, when the literature is analyzed, it is seen that studies conducted to raise awareness in OP are focused on postmenopausal women and geriatric individuals (22-24). Although there is a need to raise awareness about OP in every age period, raising awareness at young ages and increasing the level of knowledge on this subject will provide more effective results in improving bone health and preventing OP (25). Therefore, in our study, we aimed to increase the awareness and knowledge levels of physiotherapy and rehabilitation students who will have an important role in health services in the fight against OP. In this context, we compared the OP knowledge levels of the students before and after the awareness training given thorough video and brochure methods. In the studies presented in the literature on OP knowledge and awareness level, it is seen that scales prepared by researchers are mostly used as assessment tools (26-28). In our study, we preferred to use the R-OKT scale, whose validity and reliability have been proven nationally and internationally (17,18).

When the current literature on OP awareness level is examined, it is seen that both video conferencing methods and traditional education methods given with printed materials provide a significant increase in the level of OP knowledge. In this regard, Lopez-Olivo et al. (29) compared the effectiveness of written booklet and video-based education in a randomized controlled study with 225 patients with OP. As a result, they found that the level of OP knowledge increased statistically significantly in both education groups (29). In the randomized controlled study of Şahin et al. (30) investigating the level of OP knowledge in patients with Parkinson's disease, a comparison was made between informative brochure and face-to-face traditional education model given in addition to this. As a result of the study, it was reported that the level of OP knowledge increased significantly in both groups in the early period ($p<0.001$), but there was no significant difference between the two groups in terms of knowledge level after the training (30). Chotiyarnwong et al. (31) conducted a randomized controlled study with 413 participants who applied to an orthopaedic clinic for similar purposes. In this study, two different groups were formed as traditional lecture and video lecture, and the effectiveness levels of these types of education on OP knowledge levels were compared. It was reported that there was no statistically significant difference between the two groups before and after the training and that video-based training was as effective as traditional face-to-face training (31). In the present study, the effectiveness levels of two different training methods, brochure and video, were compared in order to increase the OP knowledge level of physiotherapy and rehabilitation students. Similar to the literature, it was seen that the OP knowledge level of both the BG and the VG increased significantly after the training ($p<0.001$). However, there was no significant difference between the two groups in terms of OP knowledge level after the training. We think that the fact that the brochure material contains visual expression and important information is emphasized with bold fonts is effective on the similar results with video training. Unlike the findings of our study, in the study conducted by Therdyothin and Amphansap (32) which compared training through Video Podcasts with traditional face-to-face education using reading materials in orthopedic residents' OP education, the VG initially had a lower OP knowledge level. However, after the training, the test score average of the VG was significantly higher than that of the traditional group ($p<0.001$). It was reported that the increase in knowledge was more pronounced among younger participants in the VG. Interestingly, however, participants stated that they preferred live lectures over Video Podcasts (32). Sunthornsup et al. (33) compared brochure and video methods for family education of children with juvenile idiopathic arthritis. In this study, which had a similar chronic disease education with OP, it was reported that the VG was significantly superior to the BG in terms of knowledge score in the evaluation performed immediately after the education ($p=0.003$). In addition, it was reported that video education (83.5%) increased knowledge more than brochure (69.1%) in parents who were found to have a lower level of education. However, in the follow-up evaluation performed four weeks later, it was reported that the scores of both groups were significantly higher than the baseline level, but the difference between the two groups decreased. In this study, the researchers emphasized that the video method provided ease of comprehension especially in participants with low education level, but both training methods created a permanent effect (33). In the light of this information, it has been observed that OP education by videoconferencing method can be as effective as traditional printed materials such as brochures, and it can even provide higher short-term learning in some conditions such as young age and high education level in the literature. However, in many studies conducted on this subject, it was observed that there was no statistically significant superiority between the two methods used for learning. Video-containing trainings may be more interesting and more memorable for students who have a high use of technology and are prone to audiovisual learning. As a matter of fact, in the study conducted with orthopaedic assistants, it was observed that the VG provided much higher success. Therefore, considering that the most effective learning method is the one that is sensitive to the needs and preferences of the target audience, we think that it would be important for educators to use traditional and video conferencing methods together by using hybrid methods. Vallée et al. (34) reported that hybrid education consistently showed superior effects on knowledge outcomes compared to traditional education methods in health education in their study in which they compared education methods in medical students, which supports this idea.

In the present study, when the OP knowledge level and awareness of the participating students were evaluated using

the R-OKT scale, it was shown that it increased significantly after the training ($p<0.005$). In addition, while the knowledge level of the classes was similar before the training, it was observed that there was a statistically significant difference after the training ($\chi^2=52.222$, $p<0.001$); especially 2nd grade students had higher scores in the nutrition and exercise subheadings compared to other classes. This suggests that the knowledge about OP was reinforced within the scope of the current study and that the previous academic background contributed to the learning process. Similar to the results of our study, a positive correlation was observed between academic achievement (GPA) before and after the training and OP knowledge scores ($r=0.220$, $p=0.001$). This result supports that participants with high academic achievement have more knowledge about OP and that the training shows more effective results in these students. In the current study, when the total R-OKT scores of the first year students before the training were analyzed, it was observed that they had lower scores than the fourth year students. Erçalık et al. (35) examined the OP knowledge levels of students studying in the departments of nutrition and dietetics and physiotherapy and rehabilitation, whose participant population closely resembled that of our study. Using the R-OKT scale, as in our study, they similarly found that fourth-year students had significantly higher total scores than first-year students (35). On the other hand, when analyzing the post-education results of the R-OKT nutrition and exercise subscales in our study, a more pronounced increase in scores was observed in first-year students compared to their pre-education levels, whereas, despite having higher baseline knowledge levels, the increase in fourth-year students was more limited. We believe that this may be due to the fact that as the class level increases, knowledge levels reach a certain threshold, thereby reducing the additional contribution of the provided education. The findings of Aybala Koçak et al. (36) in their study on physical therapy and rehabilitation students in which they investigated the level of knowledge about calcium and vitamin D deficiency and OP are supportive of our results as they reported that the level of knowledge of students about OP, calcium and vitamin D gradually increased with education during school education. In this context, the inclusion of education on OP awareness in the curriculum from the early stages and its comprehensive handling will contribute to the physical therapy and rehabilitation students who will work with both the risk group and osteoporotic patients after graduation to start clinical practice better equipped in this context. These results reveal the necessity of periodically repeating the trainings with different methods in order to increase the long-term permanence of the education offered in the early period, especially since the rate of increase in the knowledge of the students in the advanced classes is slower.

Study Limitations

The limitations of our study are that only short-term knowledge assessment was performed after the training. The reason for this preference is that the outcome assessment performed immediately after the training can be performed without loss of sample. In addition, it was predicted that large sample losses may occur due to the presence of students approaching graduation status among the participating students. For this reason, further studies are needed to evaluate the long-term permanence of the effects of the training. Although the study aimed to reach the entire population, the risk of selection bias due to voluntary participation could not be entirely eliminated. However, stratified sampling based on academic achievement and a high participation rate were intended to mitigate this risk. In addition, standardisation and quality assessment of different training materials should be considered in future studies to be conducted in this context. There is a need for studies evaluating the evidence-based, up-to-date, comprehensible and socio-cultural appropriateness of video and brochure training contents. Additionally, methods for collecting participants' feedback on the clarity and effectiveness of educational materials can be incorporated into the study, thereby expanding the scope of the findings.

Conclusion

In the present study, we examined the effectiveness of two different training methods to increase OP awareness in physiotherapy and rehabilitation students. We concluded that both brochure and video conference methods statistically significant increased the level of OP knowledge. Especially the fact that second-year students had higher post-education knowledge levels in the nutrition, exercise and total subcategories compared to other grades suggests that the effect of education may vary depending on class levels. Furthermore, the fact that the increase in post-training knowledge of fourth-grade students was more limited compared to the first-grade students indicates that the effect of the trainings given in the early years of education is stronger and the rate of knowledge acquisition decreases in the following grades. In addition, the positive correlation between students' grade point averages revealing their academic achievement and their OP knowledge scores suggests that academic achievement may be an important factor in increasing OP awareness.

The results of our study show that both traditional printed materials and video education methods are effective in increasing the level of knowledge and awareness of OP. Especially considering that the early effects of the education given in the early grades are more pronounced, it will be important to integrate different educational methods into the curriculum to be repeated periodically from the beginning in terms of the permanence of the information. In the future, we recommend that studies should be conducted to evaluate the quality and reliability of different types of educational materials such as videos and brochures used for OP education in terms of content, and to investigate long-term knowledge gains.

Ethics

Ethics Committee Approval: Our study was randomized and experimental type, and ethical approval was obtained from Osmaniye Korkut Ata University Health Sciences Research Ethics Committee (no: E.177950, date: 23.05.2024).

Informed Consent: Participants who voluntarily agreed to participate and gave written informed consent were included in the study.

Footnotes

Authorship Contributions

Concept: B.T., Design: B.T., Data Collection or Processing: B.T., T.B.K., A.N.Ş., Analysis or Interpretation: B.T., T.B.K., A.N.Ş., Literature Search: B.T., T.B.K., A.N.Ş., Writing: B.T., T.B.K., A.N.Ş.

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