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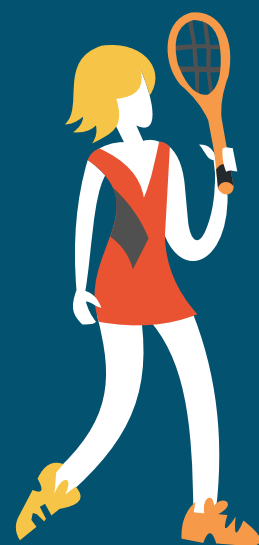
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CONTENTS

Serkan N. Metin, Kamil Uzgur, Yağmur Akkoyunlu, Nurettin Konar. The relationship between burnout levels and mindfulness of university students-athletes.....	97
Olena Nesen, Victoriya Klymenchenko, Iryna Kryventsova, Lidiya Zavatska, Mateusz Tomanek, Wladyslaw Jagiello. Interactive tasks as a means of theoretical training in physical education of students	104
Sercan Yılmaz, İbrahim Erdemir. The influence of quadriceps and hamstring strength on balance performance	112
Mashud, Syamsul Arifin, Advendi Kristiyandaru, Y Touvan Juni Samodra, I Gusti Putu Ngurah Adi Santika, Didi Suryadi. Integration of project based learning models with interactive multimedia: Innovative efforts to improve student breaststroke swimming skills	118
Fatih Harun Turhan, Burak Canpolat. Researching the future expectations of sports sciences students	126
Ting Li. Analysis of the cultivation of social responsibility of physical education students in the context of Healthy China.....	135
Information	144

The relationship between burnout levels and mindfulness of university students-athletes

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Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

Abstract

Background and Study Aim Athlete burnout is a common issue that negatively affects the performance and well-being of athletes. This study was conducted to examine the relationship between burnout levels and mindfulness of students who are active athletes.

Material and Methods Descriptive analysis and correlational research model were utilized in the study. As data collection tools in the study, "Personal Information Form" including demographic information of the students was requested at first. Two scales were used: The "Athlete Burnout Scale," developed by Raedeke and Smith and adapted into Turkish by Kelecik et al.; The "Athlete Mindfulness Scale," developed by Thienot et al. and adapted into Turkish by Tingaz. The research group consisted of a total of 378 people, 96 women and 282 men, who were selected by random sampling method, actively practicing sports. In the study, t-test was used for pairwise comparisons and ANOVA test was used for multiple comparisons. Pearson Correlation analysis was used to determine the relationship between mindfulness and burnout levels.

Results In the study, it was found that there were significant differences in burnout levels depending on the gender variable and in some mindfulness sub-dimensions depending on the branch variable. In addition, it was determined that there was a significant negative relationship between burnout levels and mindfulness levels.

Conclusions The study found that active sports students with high mindfulness levels had lower levels of burnout, indicating that mindfulness may play a role in reducing burnout. While there were differences in mindfulness sub-dimensions based on age and sport type, overall mindfulness levels did not differ significantly.

Keywords: active athlete, burnout, mindfulness, student

Introduction

Burnout was first introduced by Freudenberger in 1974, and as a result of his observations on the changes caused by the intensity of the work pace on the employees and himself, he determined that it is a state of mind that negatively affects the person and reduces his productivity [1]. As in many fields of study, researchers have addressed the concept of burnout from different angles by considering that the performance of athletes can be negatively affected [2, 3, 4, 5]. Although participation in sport is generally seen as enjoyable, athletes face many challenges during the long period of athletic development, such as intensive training and heavy academic load [6]. The difficulty of coping with these challenges may cause athletes to experience a maladaptive psychological syndrome known as athlete burnout [7]. When we examine the concept of burnout from a sporting perspective, it is defined as the physical and psychological toll that accompanies the intense participation of an individual in an activity and that the individual

faces with the prolonged duration of this process [8]. Conceptually, athlete burnout is considered a syndrome characterized by three main symptoms: emotional and physical exhaustion, loss of value in sport, and decreased sense of accomplishment [5]. Athlete burnout is associated with negative outcomes such as decreased motivation, impaired performance, and sport dropout [9].

Considering these negative effects of burnout on athletes, it can be thought that there should be a way to cope with it. In this context, it may help athletes to cope with the feeling of burnout if they stay only in the emotional field they have at that moment and do not worry about the past and the future. In this respect, it can be said that the concept of mindfulness has started to gain importance in recent years.

Mindfulness is an approach that seeks to reveal the experiences offered by each moment without ignoring the set goals [10]. Mindfulness is an innate capacity that can be developed through mindfulness-based practices [11]. It also helps athletes learn to live with stressors and challenges that may arise during training and competition or during preparation, such as competition, intense

training and injury. An athlete with a high level of mindfulness is able to maintain optimal focus while observing their current performance, monitor their internal reactions to stressors and specific experiences, and avoid unnecessary self-criticism [12]. Bühlmayer et al., in their meta-analysis study of mindfulness awareness on sportive performances, found that mindfulness practices had a positive effect on the performance of the participants. They also stated that more studies should be conducted on mindfulness and sportive performance and that it would be beneficial to consider mindfulness as a mental skills training approach for athletes [13].

It can be thought that mindfulness-based practices can be used to improve performance by eliminating or alleviating the psychological barriers to performance such as anxiety, attention, emotion regulation, and burnout, which are likely to be seen in athletes. However, while these practices are used to improve performance, it may be important to know the effect of different variables such as branch and gender on burnout or mindfulness level. In this context, our study aims to examine the relationship between burnout and mindfulness levels of university students who are active athletes. In addition, mindfulness and burnout levels were tried to be examined in terms of different variables. It is thought to contribute to the literature in these aspects.

Materials and Methods

Participants

A total of 378 people, 96 of whom were female and 282 of whom were male, who were studying at Bandırma Onyedi Eylül University and practicing active sports were included in the study. The students participating in the study were selected by non-probability convenience sampling method [14]. Participants were informed before the distribution of the scales and it took approximately 10 minutes. Demographics of participants appear in Table 1.

Table 1. Demographic information on participants

Variables	Groups	F	%
Gender	Female	96	25.4
	Male	282	74.6
Age	18-20	261	69
	21 and over	117	31
Sport Branch	Football	99	26.2
	Volleyball	99	26.2
	Basketball	72	19
	Others	108	28.6
Total		378	100

Research Design

In this study, correlational research and descriptive analysis models were used in accordance with the objectives. The correlational research model specifies a problem, variables and relationships between variables [15]. The descriptive model is an approach that aims to describe a case that existed in the past or is still present as it is. The person or object that has been the subject of research should be tried to be defined with its own conditions and as it is. The researched object cannot be influenced, changed or transformed in any way. What is wanted to be known is tried to be taken [16]. The information in the research was obtained by utilizing the questionnaire technique.

Data Collection Tools. The data in this study were collected using a questionnaire form prepared by the researcher asking demographic data, “Athlete Burnout Scale” and “Athlete Mindfulness Scale”.

Personal Information Form: A questionnaire form was created to learn the demographic information of the participants in terms of age, gender and branch.

Athlete Burnout Scale: In the study, the scale developed by Raedeke and Smith (2001) to determine the burnout levels of student athletes was adapted into Turkish by Kelecek et al. (2016) [17, 18]. The scale consists of 13 questions including emotional and physical exhaustion (1-3-7-9-10), depersonalization (2-5-8-13) and decreased sense of accomplishment (4-6-11-12) sub-dimensions. The scale has a 5-point Likert scale with the statements 1- Never, 2- Very Rarely, 3- Sometimes, 4- Most of the Time and 5- Always.

Athlete Mindfulness Scale: The scale was developed by Thienot et al. (2014) and adapted to Turkish after a validity and reliability study by Tingaz (2020) [19, 20]. It consists of 15 items and has 3 sub-dimensions: awareness (1-2-3-4-5), non-judgment (6-7-8-9-10) and refocusing (11-12-13-14-15). The scale includes (1) Almost Never, (2) Very Rarely, (3) Rarely, (4) Sometimes, (5) Most of the Time, and (6) Almost Always and is a 6-point Likert scale.

Collection of Data. The data collection tools used in the study were applied face-to-face to the active sports students who constituted the sample. Before the form was applied, it was informed that participation in the study was voluntary.

Ethical Dimension of Research. After the voluntary consent form was obtained from the participants in the study, information was given about the scales applied. In order to conduct the study, the necessary permissions were obtained with the decision numbered 2023-2 10.03.2023 of the Ethics Committee of Bandırma Onyedi Eylül University Institute of Social and Human Sciences.

Statistical Analysis

Skewness and Kurtosis (± 1.5) values of the study

were measured and as a result, it was understood that the data were normally distributed [21]. In the study, t-test was used to understand the difference in terms of burnout and mindfulness depending on the gender variable and ANOVA test was used to understand the difference depending on the branch variable. Pearson correlation analysis was used to determine the relationship between mindfulness and its sub-dimensions and burnout. SPSS 26 statistical package program was used to analyze the data.

Results

In this study, it was aimed to determine the relationship between mindfulness level and burnout level. Firstly, before correlation analysis, the relationship between gender and branch variables with mindfulness and burnout level was examined and the data obtained are presented in Table 2 and Table 3.

Table 2 shows the t-test results of active sports students according to gender variable. Accordingly, it was determined that there was a significant

Table 2. T test results according to burnout and mindfulness scores based on gender variable

Parameters	Groups	\bar{x}	s.s.	df	t	p	Cohen's d
Emotional Physical Burnout	Female	1.49	,63	376	-2.072	.039*	-0.250
	Male	1.66	,69				
Depersonalization	Female	1.55	,58	376	-2.787	.006*	-0.343
	Male	1.77	,70				
Decreased Sense of Achievement	Female	2.00	,79	376	-.496	.621	-0.056
	Male	2.05	,70				
Burnout Scale Mean	Female	1.67	,56	376	-2.036	.042*	-0.245
	Male	1.81	,61				
Mindfulness Scale Mean	Female	4,28	,64	376	.717	.474	0.088
	Male	4,22	,79				

*p<0.05

Table 3. ANOVA test results of burnout and mindfulness scores based on branch variable

Parameters	Sport Branch	\bar{x}	Ss	F	p	η^2	Tukey
Awareness	Football	4.72	1.08	0.89	.966	.001	
	Volleyball	4.70	1.04				
	Basketball	4.78	.79				
	Others	4.75	.89				
Non-judgment	Football	3.50	1.33	4.077	.007*	.032	4<1,2,3
	Volleyball	3.15	1.16				
	Basketball	3.06	1.09				
	Others	2.95	1.12				
Refocusing	Football	4.96	1.12	3.386	.018*	.026	2<1,3,4
	Volleyball	4.59	1.07				
	Basketball	5.00	.79				
	Others	4.71	.96				
Mindfulness scale mean	Football	4.39	.89	2.613	.051	.021	
	Volleyball	4.15	.72				
	Basketball	4.28	.64				
	Others	4.14	.71				
Burnout scale mean	Football	1.85	.68	1.722	.162	.014	
	Volleyball	1.66	.52				
	Basketball	1.78	.53				
	Others	1.81	.64				

Note: Others (table tennis, tennis, badminton, combat sports, athletics); *p<0.05

Table 4. Correlation table between mindfulness and burnout

Parameters		Awareness	Non-judgment	Refocusing	Mindfulness Scale Mean
Burnout Scale Mean	r	-.257**	-.062	-.241**	-.250 **
	p	.000	.226	.000	.000
	n	378	378	378	378

**p<0.001

difference in the mean of emotional and physical burnout, depersonalization sub-dimensions and athlete burnout scale ($p<0.05$). As a result of the analysis, it was determined that the burnout averages of men were higher than women. There was no significant difference between the groups in the mean of the athlete mindfulness scale ($p>0.05$). In addition, it was seen that gender had a small effect on burnout level [22].

Table 3 shows the ANOVA test results of the mindfulness levels of student athletes according to the branch variable. According to the branch variable, there is a significant difference in the sub-dimensions of non-judgment and refocusing ($p<0.05$). As a result of the Tukey test conducted to determine between which groups the difference was between, it was understood that in the non-judgmental sub-dimension, athlete students who were involved in sports such as handball, table tennis, tennis, badminton and athletics had higher scores than the others, and in the refocusing sub-dimension, students who were interested in volleyball had higher scores than the others. In addition, it was determined that the sport branch had a small effect on the sub-dimensions of non-judgment and refocusing.

Table 4 shows the correlation table between the burnout levels of the student athletes and their mindfulness. Accordingly, it was found that there was a statistically significant negative relationship between mindfulness, refocusing sub-dimensions and Mindfulness general averages ($p<0.01$). However, no significant relationship was found in the non-judgment sub-dimension ($p>0.05$). Accordingly, it can be said that those with high burnout levels have low mindfulness levels.

Discussion

In the study, the relationship between burnout levels and mindfulness levels of students who are active athletes at university was tried to be examined. In this context, firstly, the mindfulness and burnout levels of the students were examined depending on the gender variable (Table 2). Then, it was evaluated whether there was a difference between the sports branches in which the students

were active athletes and their mindfulness levels (Table 3). Finally, the relationship between burnout levels and mindfulness levels was analyzed (Table 4).

In the study, it was determined that there was a significant difference in students' burnout levels depending on the gender variable and male students had higher burnout levels than female students. No significant difference was found according to mindfulness levels. Yarnell et al., in a meta-analysis study on self-compassion and 71 articles, concluded that men have higher levels of self-compassion than women [23]. This was thought to be due to the fact that women face social evaluation more than men and that appearance and gender roles cause negative physical outcomes and unhealthy behaviors compared to men [24]. Amemiya and Sakairi stated in their study that self-compassion and mindfulness levels were lower in women, and in this case, women's burnout levels were higher than men [25]. Although this result seems to be the opposite of our study, even if it is not statistically significant in our study, it is similar to our study, since it is determined that women's mindfulness levels are higher than men's and mindfulness level has an effect on burnout. In other words, it can be said that the difference in the result may be due to the fact that the mindfulness levels of women in our study were higher than the mindfulness levels of men in the study of Amemiya and Sakairi. In addition, similar to our study, Tingaz et al. [26] and Atasoy [27] found no statistically significant difference in mindfulness levels depending on the gender variable in their studies.

In the study, when the mindfulness levels of the participants were evaluated depending on the branch variable, it was understood that there was no significant difference in the mindfulness averages, but there were significant differences between those who were engaged in handball, table tennis, tennis, badminton and athletics in the non-judgmental sub-dimension and those who were interested in volleyball in the refocusing sub-dimension. It is thought that the difference in the non-judgment sub-dimension is due to the fact that most of the branches defined as other are the branches that are

practiced as individual sports and the athletes avoid judging themselves. It is thought that the difference in the refocusing sub-dimension for the volleyball branch is due to the fact that it is a sport branch that does not involve contact with the opponent and that communicating only with teammates without entering into a dialogue with the opponent can help the athlete to refocus on the competition. In the study conducted by Atasoy on combat sports and team sports athletes, a significant difference was found in the awareness sub-dimension, while no significant difference was found between mindfulness levels [27]. In this respect, it is similar to our study. In addition, when the literature was examined, it was seen that there are many studies investigating the effect of mindfulness practices on sports [28, 29, 30, 31].

When the relationship between mindfulness and burnout was examined in the study, it was found that there was a statistically significant negative relationship between mindfulness, refocusing sub-dimensions and Mindfulness general averages, but there was no significant negative relationship in the non-judgment sub-dimension. Similar to our study, Chuang et al. determined that there was a significant negative relationship between mindfulness and burnout in their study on golfers [32]. In addition, Ameniya and Sakairi [25] and Ameniya and Sakairi [33] also found a negative relationship between mindfulness and burnout [25, 33]. In contrast to our study, Zhang et al. concluded that there

is a positive relationship between mindfulness and burnout [5]. In addition, CH Wu et al. found that there was a significant positive relationship between mindfulness and athletes' psychological skills (coping with difficulties) in a study on athletes at university [34]. In other words, it was stated that athletes with high mindfulness levels will be psychologically strong. In this context, it can be said that athletes' mindfulness levels indirectly have a negative relationship with burnout.

Conclusions

As a result of the study, it was determined that the burnout levels of active athletes with high levels of mindfulness were low, and although there were differences in mindfulness sub-dimensions according to branch and age variables, there was no significant difference in mindfulness levels. It was also determined that male students experienced more burnout than female students.

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Conflict of interest

The authors declare no conflict of interest.

References

- Freudenberger HJ. Staff Burn-Out. *Journal of Social Issues*, 1974;30(1): 159–165. <https://doi.org/10.1111/j.1540-4560.1974.tb00706.x>
- Moen F, Federici RA, Abrahamsen F. Examining possible Relationships between mindfulness, stress, school-and sport performances and athlete burnout. *International Journal of Coaching Science*, 2015; 9(1):10–15.
- Olsson LF, Madigan DJ, Hill AP, Grugan MC. Do Athlete and Coach Performance Perfectionism Predict Athlete Burnout? *European Journal of Sport Science*, 2022;22(7): 1073–1084. <https://doi.org/10.1080/17461391.2021.1916080>
- Petterson H, Olson BL. Effects of Mindfulness-Based Interventions in High School and College Athletes for Reducing Stress and Injury, and Improving Quality of Life. *Journal of Sport Rehabilitation*, 2017;26(6): 578–587. <https://doi.org/10.1123/jsr.2016-0047>
- Zhang CQ, Li X, Si G, Chung PK, Huang Z, Gucciardi DF. Examining the roles of experiential avoidance and cognitive fusion on the effects from mindfulness to athlete burnout: A longitudinal study. *Psychology of Sport and Exercise*, 2023;64: 102341. <https://doi.org/10.1016/j.psychsport.2022.102341>
- Gustafsson H, Kenttä G, Hassmén P. Athlete burnout: an integrated model and future research directions. *International Review of Sport and Exercise Psychology*, 2011;4(1): 3–24. <https://doi.org/10.1080/1750984X.2010.541927>
- Rawdeke T. Is athlete burnout more than just stress? A sport commitment perspective. *New Zealand Journal of Sports Medicine*, 1998; 26; 45–45.
- Raedeke TD, Smith AL. Development and Preliminary Validation of an Athlete Burnout Measure. *Journal of Sport and Exercise Psychology*, 2001;23(4): 281–306. <https://doi.org/10.1123/jsep.23.4.281>
- Gustafsson H, Hancock DJ, Côté J. Describing citation structures in sport burnout literature: A citation network analysis. *Psychology of Sport and Exercise*, 2014;15(6): 620–626. <https://doi.org/10.1016/j.psychsport.2014.07.001>
- Li C, Zhu Y, Zhang M, Gustafsson H, Chen T. Mindfulness and Athlete Burnout: A Systematic Review and Meta-Analysis. *International Journal of Environmental Research and Public Health*, 2019;16(3): 449. <https://doi.org/10.3390/ijerph16030449>
- Birrer D, Röthlin P, Morgan G. Mindfulness to Enhance Athletic Performance: Theoretical Considerations and Possible Impact Mechanisms. *Mindfulness*, 2012;3(3): 235–246. <https://doi.org/10.1007/s12671-012-0109-2>
- Zhang CQ, Si G, Chung PK, Gucciardi DF.

- Mindfulness and Burnout in Elite Junior Athletes: The Mediating Role of Experiential Avoidance. *Journal of Applied Sport Psychology*, 2016;28(4): 437–451. <https://doi.org/10.1080/10413200.2016.1162223>
13. Bühlmayer L, Birrer D, Röthlin P, Faude O, Donath L. Effects of Mindfulness Practice on Performance-Relevant Parameters and Performance Outcomes in Sports: A Meta-Analytical Review. *Sports Medicine*, 2017;47(11): 2309–2321. <https://doi.org/10.1007/s40279-017-0752-9>
 14. Altun IR, Çoşkun R, Bayraktaroğlu S, Yıldırım E. *Research Sciences in Social Sciences: SPSS Applied*. Sakarya Bookstore; 2004.
 15. Kurtuluş K. *Pazarlama Araştırmaları. Genişletilmiş 6. Baskı*. [Marketing Studies. Extended 6th Edition]. Istanbul University Faculty of Business Public.; 1998. (In Turkish).
 16. Karasar N. *Araştırmalarda Rapor Hazırlama*. [Reporting in Research] Ankara: Nobel publishing. 2014. (In Turkish).
 17. Raedeke TD, Smith AL. Development and Preliminary Validation of an Athlete Burnout Measure. *Journal of Sport and Exercise Psychology*, 2001;23(4): 281–306. <https://doi.org/10.1123/jsep.23.4.281>
 18. Kelecek S, Kara FM, Kazak Çetinkalp FZ, Aşçı FH. “Sporcu Tükenmişlik Ölçeği”nin Türkçe Uyarlaması [The Turkish Adaptation of “Athlete Burnout Questionnaire]. *Spor Bilimleri Dergisi*, 2017;27(4): 150–161. <https://doi.org/10.17644/sbd.311371>
 19. Thienot E, Jackson B, Dimmock J, Grove JR, Bernier M, Fournier JF. Development and preliminary validation of the mindfulness inventory for sport. *Psychology of Sport and Exercise*, 2014;15(1): 72–80. <https://doi.org/10.1016/j.psychsport.2013.10.003>
 20. Tingaz EO. Sporcu Bilinçli Farkındalık (Mindfulness) Ölçeği: Türkçeye Uyarlama, Geçerlik ve Güvenirlik Çalışması. [Adaptation Of The Mindfulness Inventory For Sport Into Turkish: A Validity And Reliability Study]. *Spormetre The Journal of Physical Education and Sport Sciences*, 2020; 18(1); 71–80. <https://doi.org/10.33689/spormetre.642682> (In Turkish).
 21. Tabachnick BG, Fidell LS, Ullman JB. *Using multivariate statistics*. Boston, MA: pearson; 2007.
 22. Cohen, J. *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum; 1988.
 23. Yarnell LM, Stafford RE, Neff KD, Reilly ED, Knox MC, Mullarkey M. Meta-Analysis of Gender Differences in Self-Compassion. *Self and Identity*, 2015;14(5): 499–520. <https://doi.org/10.1080/15298868.2015.1029966>
 24. Ferguson LJ, Kowalski KC, Mack DE, Sabiston CM. Self-compassion and Eudaimonic Well-Being During Emotionally Difficult Times in Sport. *Journal of Happiness Studies*, 2015;16(5): 1263–1280. <https://doi.org/10.1007/s10902-014-9558-8>
 25. Amemiya R, Sakairi Y. The role of self-compassion in athlete mindfulness and burnout: Examination of the effects of gender differences. *Personality and Individual Differences*, 2020;166: 110167. <https://doi.org/10.1016/j.paid.2020.110167>
 26. Tingaz EO, Ekiz MA, Çakmak S. Examination of mindfulness and impulsiveness in university student-athletes in terms of sports injury development history. *Current Psychology*, 2022;41(8): 5134–5142. <https://doi.org/10.1007/s12144-020-01024-4>
 27. Ahi Evran University, Turkey, Atasoy M. Investigation of Mindfulness Levels of Individuals Playing Team and Combat Sports. *Education Quarterly Reviews*, 2022;5(2). <https://doi.org/10.31014/aior.1993.05.02.513>
 28. Sanada K, Montero-Marin J, Alda Díez M, Salas-Valero M, Pérez-Yus MC, Morillo H, et al. Effects of Mindfulness-Based Interventions on Salivary Cortisol in Healthy Adults: A Meta-Analytical Review. *Frontiers in Physiology*, 2016;7. <https://doi.org/10.3389/fphys.2016.00471>
 29. Scott-Hamilton J, Schutte NS, Brown RF. Effects of a Mindfulness Intervention on Sports-Anxiety, Pessimism, and Flow in Competitive Cyclists. *Applied Psychology: Health and Well-Being*, 2016;8(1): 85–103. <https://doi.org/10.1111/aphw.12063>
 30. Solberg EE. Stress reactivity to and recovery from a standardised exercise bout: a study of 31 runners practising relaxation techniques. *British Journal of Sports Medicine*, 2000;34(4): 268–272. <https://doi.org/10.1136/bjbm.34.4.268>
 31. Goodman FR, Kashdan TB, Mallard TT, Schumann M. A brief mindfulness and yoga intervention with an entire NCAA Division I athletic team: An initial investigation. *Psychology of Consciousness: Theory, Research, and Practice*, 2014;1(4): 339–356. <https://doi.org/10.1037/cns0000022>
 32. Chuang HY, Wang FJ, Chi LK. Mechanisms of mindfulness for professional golfers: the mediating role of basic psychological needs. *Current Psychology*, 2023;42(7): 5462–5469. <https://doi.org/10.1007/s12144-021-01877-3>
 33. Amemiya R, Sakairi Y. The role of mindfulness in performance and mental health among Japanese athletes: An examination of the relationship between alexithymic tendencies, burnout, and performance. *Journal of Human Sport and Exercise*, 2019;14(2). <https://doi.org/10.14198/jhse.2019.142.17>
 34. Wu CH, Nien JT, Lin CY, Nien YH, Kuan G, Wu TY, et al. Relationship between Mindfulness, Psychological Skills, and Mental Toughness in College Athletes. *International Journal of Environmental Research and Public Health*, 2021;18(13): 6802. <https://doi.org/10.3390/ijerph18136802>

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Interactive tasks as a means of theoretical training in physical education of students

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Abstract

Background and Study Aim The research background is the challenges faced by Ukrainian educators, such as distance learning, martial law, and the digitalisation of the educational space. The purpose of the research is to determine the influence of interactive tasks in physical education on students' mastery of the theoretical material through distance learning.

Material and Methods The research involved first-year students (n=245). Students were divided into three groups: experimental group 1 (n=86), experimental group 2 (n=81), control group (n=78). The research was conducted over seven months of the 2022-2023 academic year. At the beginning and end of the research, a survey was conducted to determine interest in the discipline of "physical education". The essence of the experiment was to provide theoretical information to students using various methods and forms. During the experiment, students' theoretical preparedness was tested three times (using Google Forms). The research results were processed using licensed Microsoft Excel spreadsheet packages. The relationship between the indicators was established using correlation analysis. The reliability of differences in mean values was assessed by Student's criterion, and the difference was considered significant at $p < 0.05$.

Results The low level of students' interest in physical education was established (52%). 19% of students consider the role of physical education to be important for maintaining personal health. There is a close and medium correlation between students' subjective interest in the discipline "Physical Education" and their opinion about the importance of this discipline for their further professional activity and for maintaining their own health. The results of all theoretical tests in both experimental groups were significantly better than the results of the control group ($t=13.479-2.049$). The level of interest in physical education among students in both experimental groups increased after the experiment.

Conclusions The use of interactive tasks in physical education classes has a positive effect on the effectiveness of students' studying and mastering of theoretical material. The interactive games increased students' cognitive motivation, interest in personal health, and responsibility for their own activities to achieve results.

Keywords: physical education, students, higher education, interest, interactive tasks, teaching methods.

Introduction

The analysis of the possibilities of health-improving pedagogical technologies in the process of improving students' health shows that teaching a practical discipline distantly (online) still causes enough difficulties. Today in Ukraine, there are cases of loss of electricity and internet, and frequent air raid alarms. Many students have changed their place and conditions of stay. All of this makes it possible to utilize the potential of physical exercise only to a minimal extent.

The question of the feasibility of the traditional organization of education is increasingly being

raised by university professors. The development of education requires teachers to study and implement new teaching methods that will contribute to the formation of the necessary competencies in students [1, 2]. This is almost impossible to achieve without their commitment to self-improvement, self-education, and self-development. Bondar [3] notes that the combination of classical, active, and interactive methods allows for a higher level of student activity, increased learning motivation, and higher levels of learning material assimilation. The author recommends using such methods and forms of classes as independent work, creative exercises, and interactive games.

Dzhurynskyi's research [4] showed examples of the use of such teaching methods as "brainstorming",

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problem lectures, heuristic conversations, and situational modelling. The author notes that the use of these interactive teaching methods contributes to the formation of sustainable motivation for physical education, health promotion, and mass sports activities. This approach to teaching helps to: acquire special knowledge of pedagogy, physical education, and the regulatory framework; study key concepts in the theory and methodology of physical education, and promote a healthy lifestyle.

According to other authors [5], positive changes in the activation of students' cognitive activity through the implementation of independent work of a creative and active nature have been established. The authors suggest completing tasks through interaction with classmates, the information field, and social networks.

The importance of interactive teaching methods is emphasized in other studies. For example, Vaskov et al. [6] revealed the theoretical foundations and features of the practical implementation of the interactive method "Joint Project". This method has improved the quality of students' learning processes. The method is based on activating the involvement of all students in cooperation in learning, enabling each student to express their own opinion. Marchenko et al. [7] provide a detailed description of interactive teaching methods that they recommend for use with students. The authors emphasize that such teaching methods contribute to: diversification of the educational process; and the development of students' cognitive interests and teamwork skills. The methods create an educational environment in which theory and practice are learned simultaneously. This approach contributes to the formation of students' critical and logical thinking.

According to research by Hidayat et al. [8] and Bellaera et al. [9], motivation for active learning; use of dialogue-based exercises; interaction between students and teachers positively influenced the development of students' critical thinking skills in the physical education field. Carr et al. [10] propose active online learning methods through interaction between students and teachers. This approach significantly reduced the difference in performance between offline and online students.

Another study indicates that in order to increase students' cognitive activity and interest in self-education, it is necessary to improve the teaching of the theoretical section of the physical education course [11]. The author proposes to realize this through the involvement of new information technologies and modern teaching methods. It has been found that increasing motivation to obtain and master theoretical knowledge contributes to the effectiveness of physical exercises. The absence or low level of theoretical knowledge in physical education dramatically reduces the effectiveness

of teaching and education and weakens interest in physical exercise.

A detailed analysis of the motivational aspect of students' physical activity through the theory of self-determination is shown in the research of Ntoumanis et al. The authors note that one of the ways to get students interested in physical activity is to provide reasonable information about the benefits of physical activity. The authors emphasize creating conditions for students to interact with each other, the teacher, and other educational spaces.

The above information indicates an increased demand in the educational environment for the use of interactive methods in the organization of offline and online learning. Special attention should be paid to the peculiarities of using the latest methods of online learning in teaching the practical discipline of "physical education".

The purpose of the research is to determine the influence of the introduction of interactive tasks in physical education on the level of mastering the theoretical material by students and their interest in classes during distance learning.

Tasks:

1. To choose a publicly available location of electronic materials and to create interactive tasks and video presentations for each topic of theoretical blocks of the program "Physical Education" for students.
2. To conduct a survey to determine interest in the subject "physical education" among first-year students.
3. To implement interactive tasks and video presentations of physical education classes and to test their influence on the level of students' theoretical knowledge and interest in the subject.

Materials and Methods

Participants

The research involved 245 first-year students. The students were divided into three groups: experimental group 1 (n=86), experimental group 2 (n=81), and the control group (n=78). Informed consent was obtained from all participants to participate in this experiment and to post video materials about their participation in accordance with ethical standards.

Research Design

The research was conducted over seven months of the 2022-2023 academic year. At the beginning and end of the research, a survey was conducted to determine interest in the discipline of physical education. The survey was conducted using Google Forms, in which students had to mark from 1 to 9 points their attitude toward the proposed questions. 1-3 points were assessed as a low level, 4-6 as an average level, and 7-9 as a high level.

Pedagogical experiment: theoretical information for students of experimental group 1 (EG1) was covered through videopresentations at the beginning of the class. The theory was provided through a search or problem-based method for solving interactive tasks (Table 1) and was supplemented by video presentations on some topics for students of experimental group 2 (EG2). At the end of the lesson, another interactive task was offered to consolidate the theoretical information provided during the lesson. The theoretical information was provided by the teacher only verbally at the beginning of the class or during the class for students in the control group (CG).

For seven months of the pedagogical experiment, the students' theoretical preparedness was tested three times (using Google Forms). The questions revealed information about three modules offered for mastering during physical education classes. Each of the tests consisted of 20 questions. Students

received 1 point for a correct answer, and 0 points for an incorrect answer.

The content of the practical and theoretical parts of the classes in all three groups was the same. The methods of presenting theoretical information to students were different. Classes were held remotely on the Google Meet online conference platform.

Statistical analysis

The research results were processed using Microsoft Excel. The relationship between the indicators was established using correlation analysis. The reliability of differences in mean values was assessed by Student's t-test, the difference was considered significant at $p < 0,05$.

Results

Students didn't highly mark their interest in the discipline "physical education" at the beginning of the research (fig. 1).

Table 1. Examples of interactive tasks on different topics of the curriculum

Topics of the curriculum	Links to interactive tasks
Physical training, development of physical qualities	https://learningapps.org/view28516070 https://learningapps.org/watch?v=py3izkt8c23
Development of physical qualities by means of various sports	https://learningapps.org/watch?v=p2x4pxggn23 https://learningapps.org/watch?v=p2q04d1tn23
Preventive and recreational exercises	https://learningapps.org/watch?v=py8oozyqj23

Note: The following interactive online tasks (links to them) were prepared on the learningapps.org platform and are available for viewing and completion both on mobile devices (phones and tablets) and personal computers.

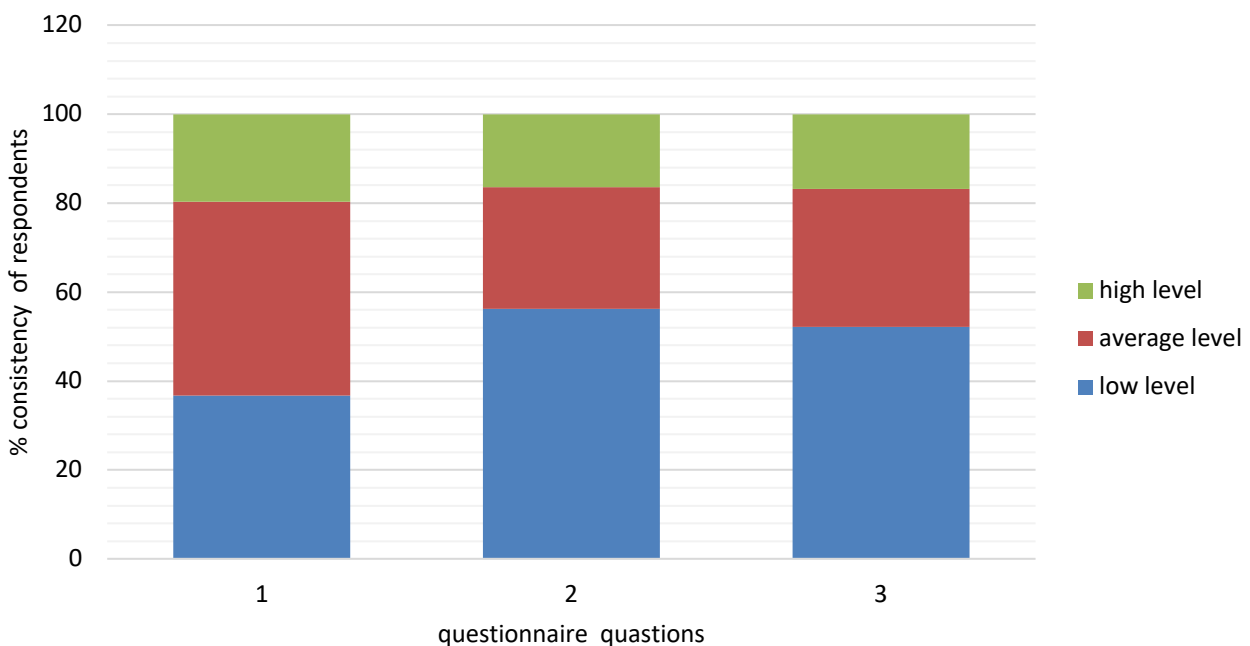


Figure 1. Interest in physical education and its role in students' life and professional activity: 1 - the importance of physical education for maintaining personal health; 2 - importance of physical education for your further professional activity; 3 - personal interest in physical education

Only 19% of students place the role of physical education in maintaining health at a high level. 56% of students put the importance of physical education for further professional pedagogical activity at a low level of importance. 52% of students admit to having low interest in physical education.

There is a close and medium correlation (Table 2) between students' subjective interest in the discipline "Physical Education" and their opinion about the importance of this discipline for their further professional activity and personal life to maintain their own health.

The students' interest in the classes is directly related to their subjective understanding of the place of this discipline in their future professional activities (Table 2). During the pedagogical experiment, theoretical preparedness on the topics studied was tested three times (Fig. 2).

Students in the control group (Fig. 2) showed an improvement in their results ($t=5.699$) in the first two tests. There was no significant difference between the results of the second and third tests ($t=1.723$).

A similar trend is observed with the results of EG1: after the first test, the average number of points increased ($t=6.366$).

For EG2 students, the average results of all three

tests had approximately the same number of correct answers ($t=1.962$). There was no improvement between the results of the second and third tests ($t=1.902$).

According to the results of the first test on theoretical proficiency, EG2 students had a significantly higher mean score of correct answers than CG ($t=13.479$) and EG1 ($t=12.515$).

Although there was a difference between the results of the second and third tests in the results of EG1 and EG2, it wasn't statistically significant ($t=1.902$ and 1.951 , respectively).

The results of students in the control group in the second and third tests were significantly lower than those of the experimental group 1 ($t=2.049$ and 2.143 , respectively) and the experimental group 2 ($t=9.181$ and 9.543 , respectively).

The results of the students' survey on their interest in physical education are shown in Fig. 3. The results of the CG remained almost unchanged compared to the first survey. The interest of students in EG1 and EG2 increased slightly (Fig. 3).

Discussion

The results of our research confirm the opinion of other authors [1, 2, 13, 14] about the need to find new, non-standard methods, means, and approaches

Table 2. Correlation between the results of the survey of higher education students on the importance of the discipline "Physical Education" (r)

Questionnaire indicators	Importance of physical education for maintaining your health (points)	Importance of physical education for maintaining your health (points)
Your personal interest in physical education (points)	0.973	0.485

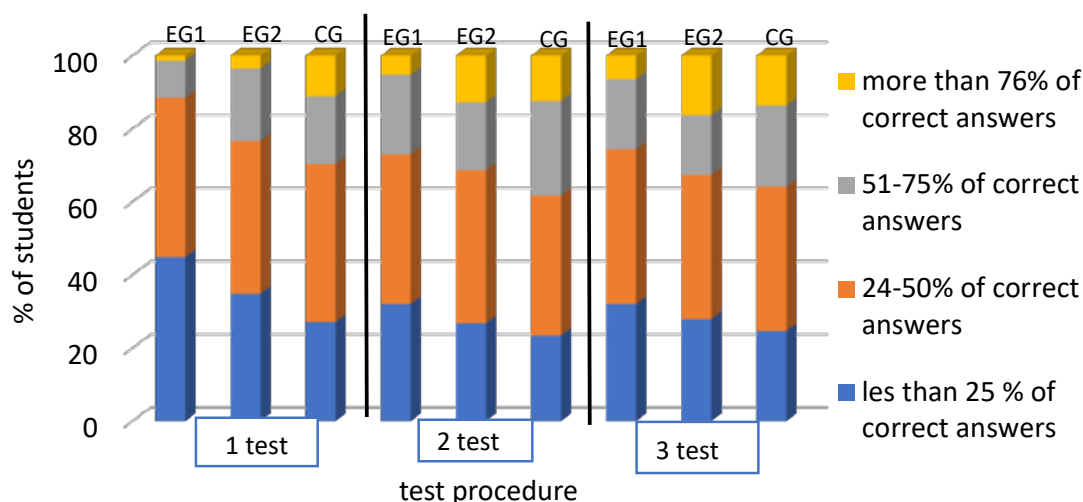


Figure 2. The level of students' theoretical preparedness on different topics of the curriculum (% of students): CG - control group; EG1 - experimental group 1; EG2 - experimental group 2

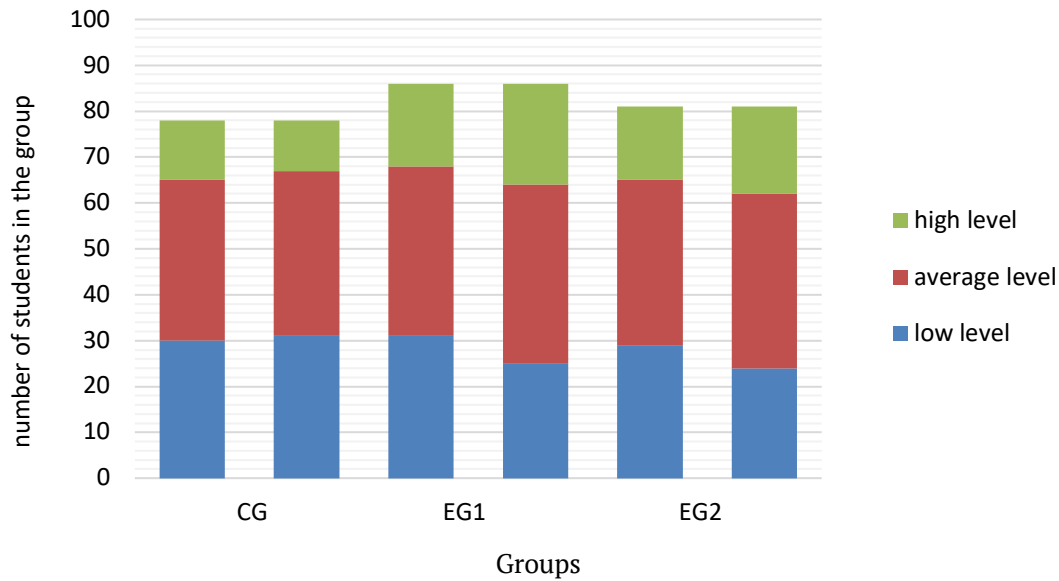


Figure 3. Students' interest in physical education at different stages of the research: 1 - at the beginning of the research; 2 - at the end of the research

to implement effective learning.

Our results indicate that the introduction of interactive methods in the process of teaching students increases the efficiency of learning theoretical information. The positive impact of online interactive tasks is noted by Crisp [15]. The author points out that the use of such tasks in theoretical testing is a very effective means of learning. Students are looking for ways to correct them on their own, which is important in learning. Abdelsamie [16] also calls interactive online assessments a good way to teach students. The author notes that this form of assessment can help students retain information and test their understanding of the material in a more engaging and interactive way. With this approach, teachers additionally meet students' needs for digitalization in the process of acquiring new knowledge.

We proposed similar interactive tasks as a variant of formative assessment. The main purpose of such tasks was the absence of assessments. It was necessary to find the right solution to the proposed situations by trying and correcting mistakes. The use of such tasks in our research led to an improvement in the theoretical preparedness of student teachers in the field of physical education.

The data we obtained indicate that students don't consider gaining knowledge of physical education, disease prevention, methods and ways of recovery and relaxation, as well as improving their physical performance, important for themselves and their future professional activities. The lack of interest in physical activity is also mentioned by Homon et al. The author emphasizes the decline in the level of health of Ukrainians and life expectancy. It is noted that pupils recognize their low interest in physical activity against the background of a

growing number of pupils who are excused from school. Kirch et al. [17] point to a decrease in students' motivation for physical education and recommend that teachers choose the content of classes based on students' motivations for physical activity. Cantos [18] describes a similar problem in her work. The author emphasizes the need to take measures to encourage the interest of the university community to participate in and develop physical education programs.

Bevans et al. [19] identify factors that influence students' participation in physical education: student engagement and perception of competencies in the physical education field. The authors point out that practical performance of tasks positively contributed to students' involvement in physical education, and inactive learning was negatively associated with student involvement. These effects were especially pronounced among students who didn't consider the development of competencies in the field of physical education important for themselves. Similar findings are shown in the research by Dzhurynskiy [4] and Nesen et al. The authors point to a significant increase in interest in learning and its effectiveness when using interactive teaching methods and techniques that promote student activity and interaction with classmates, teachers, and the educational space. Our study shows similar findings. We found changes in students' interest in physical education after a non-standard way of presenting theoretical information. This approach forced students to interact with digital devices and solve problematic issues related to new information on physical education.

Scheiter et al. [20] reveal the peculiarities of using different ways of visualizing information for students during their studies. The authors note

that this approach will not always have a positive result. The authors provide the criteria under which learning through visualization will be of high quality. The video presentations used in our research took these criteria into account. They consisted of visual images and verbal explanations. All this was combined into one video sequence. Such presentations helped to attract students' attention and interest to the methodological part of the lesson, helping them to better master and deepen their knowledge.

In our research, we found evidence of increased interest in physical education among students who had higher results in theoretical tests. This is confirmed by the results of the study by Gordienko [11]. The author points to a close connection between the assimilation of theoretical information on physical education and students' practical interest in such classes. That is, it becomes more interesting for students to perform the proposed movements when they understand their structure, technique, and benefits to the body. If you do the exercises without realizing it, the student will not get the intended effect and will not feel their benefits. This will lead to a decrease in interest in physical activity in general.

We agree with the opinions of other authors [21, 22, 23, 24] about the need to find ways to combine new and time-tested teaching methods in the modern educational process. Today, this problem is being developed and studied quite actively. We believe that the issue of selecting options and means of interaction with students in the format of distance learning has not yet been sufficiently

studied in practical disciplines. Such a discipline is "physical education" for university students. Our research shows one of the options for improving the educational process of this discipline in view of distance learning and modern student demands for digitalization of the environment.

Practical recommendations

The use of interactive online tasks in the form of game-based assessments at the beginning or end of classes will help to consolidate the acquired knowledge. Such tasks, along with video presentations, will increase the effectiveness of learning in general by forming a conscious approach to physical education.

Conclusions

It has been established that the use of interactive tasks in physical education classes has a positive effect on the effectiveness of students' studying and mastering of theoretical material. Interactive games increase students' cognitive motivation and responsibility for their own activities to achieve results. They also become more interested in personal health.

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References

1. Homon L, Holoviichuk I, Nesterenko O, Hloba T, Ploshynska A. Health-Forming Technology of Physical Education of Higher Educational Institution Students Based on Sports-Oriented Training. *Journal of Curriculum and Teaching*, 2022;11(3): 64. <https://doi.org/10.5430/jct.v11n3p64>
2. Bezkopylnyi O, Bazylchuk O, Sushchenko L, Bazylchuk V, Dutchak Y, Ostapenko H. Peculiarities of application of interactive educational technologies in training of future teachers of physical culture to work with health protection in secondary school. *Journal of Physical Education and Sport*, 2020; 20 (Suppl. issue 1):291 – 7, <https://doi.org/10.7752/jpes.2020.s1040>
3. Bondar SP. Methods of activating the educational and cognitive activity of students as an important component of person-oriented education. *Naukovij chasopis NPU imeni M. P. Dragomanova. Seriya 5. Pedagogichni nauki*, 2011; 26:184-9. (In Ukrainian).
4. Dzhurynskyi P. Interactive methods of teaching students majoring in "physical education" at active and reproductive stage. *Science and Education*, 2015; 2:21-6.
5. Nesen O, Kozlov A, Spuziak V. Increasing the interest of future primary school teachers in performing independent work during studies at institutions of higher education. *Scientific Bulletin of Uzhhorod University. Series: «Pedagogy. Social Work»*. 2023; 1 (52):124-8.
6. Vaskov YV, Sizonenko IE. The ways of implementing interactive methods in the educational process of students of higher educational institutions. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*, 2015;19(2): 11–15. <https://doi.org/10.15561/18189172.2015.0202>
7. Marchenko N, Vanovska I. Interactive Methods of Teaching the Humanities in Higher Education Institutions. *International Journal of Management and Humanities*, 2020;4(12): 53–57. <https://doi.org/10.35940/ijmh.L1099.0841220>
8. Hidayat C, Setia A, Rohyana A, Purwanto D, Razali R, Rosalina M. Motivating Active Learning in Physical Education: Critical Thinking. *European Journal of Educational Research*, 2023;12(2): 1137–1151. <https://doi.org/10.12973/eu-jer.12.2.1137>

9. Bellaera L, Weinstein-Jones Y, Ilie S, Baker ST. Critical thinking in practice: The priorities and practices of instructors teaching in higher education. *Thinking Skills and Creativity*, 2021;41: 100856. <https://doi.org/10.1016/j.tsc.2021.100856>
10. Carr R, Palmer S, Hagel P. Active learning: The importance of developing a comprehensive measure. *Active Learning in Higher Education*, 2015;16(3): 173–186. <https://doi.org/10.1177/1469787415589529>
11. Gordienko YV. Theoretical training in physical education of higher educational establishments' girl students. *Physical Education of Students*, 2015;19(4): 3–9. <https://doi.org/10.15561/20755279.2015.0401>
12. Ntoumanis N, Standage M. Motivation in physical education classes: A self-determination theory perspective. *Theory and Research in Education*, 2009;7(2): 194–202. <https://doi.org/10.1177/1477878509104324>
13. Arufe-Giráldez V, Sanmiguel-Rodríguez A, Ramos-Álvarez O, Navarro-Patón R. News of the Pedagogical Models in Physical Education—A Quick Review. *International Journal of Environmental Research and Public Health*, 2023;20(3): 2586. <https://doi.org/10.3390/ijerph20032586>
14. Surovov AA, Bondar TS. Prospects of application of interactive methods in the process of preparation of future teachers of physical culture. *Teoriia ta Metodika Fizichnogo Vikhovannia*, 2012; 1:17-36. (In Ukrainian).
15. Crisp G. Interactive online learning and assessment. In: *EDUCAUSE in Australasia 03: expanding the learning community, meeting the challenges, 6-9 May 2003 Adelaide, Australia*. Adelaide: Causal Productions; 2003. P. 840-8.
16. AbdElsamie A. *7 Innovative Teaching Strategies To Engage Students In Online Learning*. [Internet]; 2023 Apr 3 [cited 2023 Apr 30]. Available from: <https://elearningindustry.com/innovative-teaching-strategies-to-engage-students-in-online-learning>
17. Kirch A, Schnitzius M, Spengler S, Blaschke S, Mess F. Knowing Students' Characteristics: Opportunities to Adapt Physical Education Teaching. *Frontiers in Psychology*, 2021;12: 619944. <https://doi.org/10.3389/fpsyg.2021.619944>
18. Cantos CFM. Physical education and the comprehensive model in the inclusion of the university student. Year 2019. *South Florida Journal of Development*, 2021;2(2): 1631–1635. <https://doi.org/10.46932/sfjdv2n2-039>
19. Bevans K, Fitzpatrick LA, Sanchez B, Forrest CB. Individual and Instructional Determinants of Student Engagement in Physical Education. *Journal of Teaching in Physical Education*, 2010;29(4): 399–416. <https://doi.org/10.1123/jtpe.29.4.399>
20. Scheiter K, Wiebe E, Holsanova J. Theoretical and Instructional Aspects of Learning with Visualizations: In: Zheng RZ (ed.) *Cognitive Effects of Multimedia Learning*, IGI Global; 2009. p. 67–88. <https://doi.org/10.4018/978-1-60566-158-2.ch005>
21. Vaskov Y. Enhancing the Quality of Physical Culture Education: Exploring the Role of Communicative Competence in Physical Culture Teachers. *Physical Culture, Recreation and Rehabilitation*. 2022;1(2):30–3. <https://doi.org/10.15561/physcult.2022.0203>
22. Vaskov Y. Exploring the Role of Teaching Aids in Enhancing Physical Education for Schoolchildren: A Literature Review. *Physical Culture, Recreation and Rehabilitation*. 2022;1(2):21–4. <https://doi.org/10.15561/physcult.2022.0201>
23. Nesen O. Development of speed and strength abilities of children aged 12-13 years in physical education classes in the COVID-19 pandemic. *Pedagogy of Health*. 2022;1(1):4-10. <https://doi.org/10.15561/health.2022.0101>
24. Kryventsova I, Potop V, Prusik K, Samoilov D. Development of coordination abilities of fencers aged 10-12 years living in the territory of martial law. *Pedagogy of Health*. 2022;1(2):34-8. <https://doi.org/10.15561/health.2022.0201>

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The influence of quadriceps and hamstring strength on balance performance

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Abstract

Background and Study Aim Muscular strength and balance are important components of athletic performance, and the muscles around the knee (Quadriceps and Hamstrings) provide joint stability when the knee is in motion. The aim of this study was to analyze the correlation between quadriceps/hamstring (H/Q) muscle strength, Hamstring/Quadriceps (H/Q) strength ratio and balance performance.

Material and Methods Ten male volunteers with an average age of 21.60±2.11 years, height 176.40±4.67 cm, and body weight 76.50±8.85 kg, who were students of the Faculty of Sports Sciences. Performance tests included dynamic and static balance using the Biodex Balance System and isokinetic strength using the Cybex Humac NORM®.

Results Statistically significant ($p < 0.05$) results in dynamic balance scores were found in the correlation of H/Q ratio and overall stability index (OSI) in the left leg ($r = -0.645$), and in the correlation of peak torque hamstring and anterior-posterior stability index (APSI) in the right leg ($r = 0.671$). Statistically significant ($p < 0.05$) results in static balance scores were found in the correlations of peak torque quadriceps with OSI ($r = -0.760$) and anterior-posterior stability index (APSI) ($r = -0.650$) in the right leg. No statistically significant results were found for the left leg in the static balance scores.

Conclusions As a result of the study, the relationship between quadriceps and hamstring strength and H/Q ratios and balance performance without ignoring the fact that balance is a complex feature involving the visual, vestibular, and proprioceptive systems. It can be said that muscle strength is an important factor in balance performance based on our study and other sources.

Keywords: dynamic balance, H/Q ratio, static balance

Introduction

Balance, as a basic function in daily human life and sports activities, is the process of maintaining the position of the body's center of gravity vertically above the base of support. In other words, it is the ability to maintain the body center pressure necessary to maintain the position of the body center in space within the base of support. Or to maintain movement against internal and external perturbations in a compliant and controlled state [1, 2]. Human beings rely on three sensory systems to perceive their place in space and to maintain their body position. Balance is achieved through the same systems. These are the visual, vestibular and proprioceptive systems [3]. In addition, anthropometric characteristics, such as height, weight, body composition, base of support, length, and weight of each limb can mechanically influence the balance of individuals [4, 5].

Two types of balance play an important role in the acquisition of motor skills: "Static balance", defined as the ability to maintain different positions created by adjusting the line of gravity and the

width of the support surface at a stable level of support and without the need for any external force [6, 7]. "Dynamic balance", defined as the ability to maintain or restore balance throughout the movement by neutralizing the external forces acting on the body [8, 9].

Muscular strength and balance are important components of athletic performance, especially in young athletes, and a strong relationship exists between them [10]. Experimental methods proven to improve balance ability include knee proprioception, increased knee extensor and flexor muscle strength, and improved stretch rate in the flexor muscles [11, 12]. The muscles around the knee provide joint stability when the knee is in motion. These muscles are known as the quadriceps group in the front and the hamstring group in the back. The hamstring muscle group, which consists of the biceps femoris, semitendinosus, and semimembranosus muscles, is of primary importance for running, walking, turning, stabilizing the knee, and controlling trunk movements. The quadriceps femoris, which is a combination of the anterior muscle group vastus lateralis, rectus lateralis, vastus medialis, and vastus intermedius muscles, is of primary importance for

jumping, balance, and kicking movements [13, 14].

The Hamstring/Quadriceps (H/Q) strength ratio is used to examine the similarity of moment-velocity patterns between the hamstrings and quadriceps, and to assess the functional adequacy and muscle balance of the knee. Various combinations of contraction types (concentric, eccentric, and isometric), angular velocities, and torque types (peak or angle-specific torque) can be used to calculate the Hamstring/Quadriceps (H/Q) ratio. Traditional ratios are computed using same type of torque values for each antagonist muscle group. The concentric hamstring torque divided by the concentric quadriceps torque is the conventional H/Q force ratio. The norm for the functional ratio also varies with test angular speed and is about 0.79 at $60^{\circ} \cdot s^{-1}$ [15].

The relationship between lower limb muscle strength and balance tests was reported in only a few articles, and most studies evaluated only the improvement in balance performance. Therefore, this study analyzed the correlation among different test methods for knee joint muscle strength, H/Q strength ratio, and balance performance.

Material and Methods

Participants

Ten male who were students of the Faculty of Sports Sciences, do not have any health problems, regularly practiced sports and had an amateur sports background, volunteers (average age of 21.60 ± 2.11 years, height 176.40 ± 4.67 cm, and body weight 76.50 ± 8.85 kg) participated in the study. The research was approved by Selçuk University Clinical Research Ethics Committee (Decision No: 33, Date: 04/03/2019).

Research Design

Prior to testing, participants were given an approximately 15min. standardized warm-up that included light cycling and dynamic stretching. All performance tests were completed on one occasion by participants. Tests included dynamic balance, static balance, and isokinetic strength, respectively. Some restrictions and rules have been applied to reduce external factors. All participants were asked to refrain from exercising on the test day and one week before [16]. The balance tests were performed barefoot for each leg [17], and performed between 12:00-17:00 hours to eliminate diurnal fluctuations in postural control [18]. Balance and isokinetic strength data were collected by the main researcher who was experienced at. All tests were performed at the Kinanthropometry Laboratory and Performance Laboratory of Selçuk University, Faculty of Sports Sciences.

Isokinetic Strength Measurement

The isokinetic strength measurements of the

knee were performed by an isokinetic dynamometer (Cybex NORM[®], Humac, CA, USA). Participants were seated on the isokinetic dynamometer according to the placement protocol. The participants were instructed to complete a ROM from 90° to 0° . The point of the beginning was 90° of flexion, then moving into extension.

After familiarization, each participant was asked to perform as hard and fast as possible for five repetitions at a speed of $60^{\circ} \cdot s^{-1}$ for knee extension (Quadriceps) and knee flexion (Hamstrings) muscular strength assessment for each leg. The isokinetic strength data were automatically recorded by the device as peak strength in newton meters (Nm) [9, 19].

Hamstring/Quadriceps Muscles Strength Ratio

The conventional H/Q muscle ratio was calculated according to its formal definition by dividing the maximal isokinetic hamstring (knee flexor) strength by the maximal quadriceps (knee extensor) strength for a given contraction mode and joint angular velocity.

Balance Performance Test

Balance measurements were performed using the Biodex Balance Systems (Biodex Medical Systems, Shirley, NY, USA), which has a circular platform that is free to move in the anterior-posterior and medial-lateral axes simultaneously. The Biodex Balance System (BBS) allows up to 20° of foot platform tilt, which allows the ankle joint mechanoreceptors to be maximally stimulated. The BBS measures, in degrees, the tilt about each axis during dynamic conditions and calculates a medial-lateral stability index (MLSI), anterior-posterior stability index (APSI), and overall stability index (OSI). These indexes represent fluctuations around a zero-point established prior to testing when the platform is stable. High scores on these indexes indicate poor balance, while scores close to zero indicate good balance. The platform is either stationary or has mobility levels 1-12. Level 12 is the most stable state of the platform, whereas Level 1 is the most active [20, 21].

Dynamic Balance Test

After the participants stepped barefoot on the device with platform stability set to level 6, foot angle and heel position were recorded according to the placement of the foot. For 20 seconds, they tried to stay balanced with one foot on the movable platform with their hands crossed at chest level. At the end of the test, medial-lateral, anterior-posterior, and overall stability scores were recorded.

Static Balance Test

After the participants stepped barefoot on the device platform, the foot angle and heel position were recorded according to foot placement. For 20 seconds, they tried to stay balanced with one foot on

the stable platform with their hands crossed at chest level. At the end of the test, medial-lateral, anterior-posterior, and overall stability scores were recorded.

Statistical Analysis

The data obtained in the study were summarized using the arithmetic mean (\bar{x}) and standard deviation (SD) from the descriptive statistics. Kolmogorow-Smirnov (K-S) test, one of the normality tests, was applied to the obtained data and it was determined that the data were not normally distributed. The Bivariate Correlations Pearson correlation test was applied to determine the relationship between balance performance values and isokinetic knee (right-left) strength ($60^\circ.s^{-1}$). All statistical values were evaluated at 95% confidence intervals, and the significance was set at $p < 0.05$.

Results

Descriptive statistics of quadriceps and hamstring strength, H/Q ratio, range of motion, and dynamic/static balance performance of the participants for both legs are shown in Table 1.

The only statistically significant value in the $60^\circ.s^{-1}$ isokinetic dynamometer measurements and dynamic balance scores in the left leg was $r = -0.645$ in the H/Q ratio and overall stability correlation. The only statistically significant value in the $60^\circ.s^{-1}$ isokinetic dynamometer measurements and dynamic balance scores in the right leg was $r = 0.671$ in peak torque hamstring and anterior-posterior stability correlation (Table 2).

No statistically significant results were found in the left leg $60^\circ.s^{-1}$ isokinetic dynamometer

Table 1. Dynamic and Static Balance and Isokinetic Measurement results of legs. (Values are the means \pm standard deviations).

Values	Left Leg	Right Leg
Isokinetic $60^\circ.s^{-1}$	$\bar{x} \pm SD$	$\bar{x} \pm SD$
Peak Torque Quadriceps (Nm)	233.70 \pm 29.69	240.30 \pm 28.70
Peak Torque Hamstring (Nm)	122.00 \pm 16.21	121.30 \pm 18.93
Range of Motion Quadriceps ($^\circ$)	3.40 \pm 2.84	4.30 \pm 4.45
Range of Motion Hamstring ($^\circ$)	88.80 \pm 6.91	93.70 \pm 7.38
Peak Torque H/Q (%)	52.70 \pm 6.96	51.00 \pm 8.92
Dynamic Balance		
Overall Stability Index Scores	2.28 \pm 0.52	2.33 \pm 0.43
Anterior-Posterior Stability Index Scores	1.60 \pm 0.57	1.47 \pm 0.37
Medial-Lateral Stability Index Scores	1.49 \pm 0.26	1.39 \pm 0.36
Static Balance		
Overall Stability Index Scores	2.26 \pm 0.62	2.46 \pm 0.67
Anterior-Posterior Stability Index Scores	1.50 \pm 0.56	1.73 \pm 0.64
Medial-Lateral Stability Index Scores	1.40 \pm 0.35	1.27 \pm 0.26

Nm: newton meter, $^\circ$: degree, H: hamstring, Q: quadriceps

Table 2. Strength and balance correlations.

Values	Dynamic Balance						Static Balance						
	Left Leg			Right Leg			Left Leg			Right Leg			
$60^\circ.s^{-1}$	OSI	APSI	MLSI	OSI	APSI	MLSI	OSI	APSI	MLSI	OSI	APSI	MLSI	
Peak Torque Quadriceps	r	0.348	0.009	-0.023	-0.089	0.253	-0.148	-0.469	-0.476	-0.342	-0.760	-0.650	-0.724
	p	0.325	0.981	0.949	0.807	0.480	0.682	0.172	0.164	0.334	0.011*	0.042*	0.018
Peak Torque Hamstring	r	-0.274	0.010	-0.175	0.247	0.671	0.438	-0.394	-0.322	-0.337	-0.072	0.204	-0.052
	p	0.444	0.979	0.629	0.491	0.034*	0.205	0.259	0.364	0.341	0.842	0.572	0.887
H/Q Ratio	r	-0.645	0.020	-0.112	0.218	0.406	0.431	0.076	0.165	0.014	0.409	0.578	0.432
	p	0.044*	0.957	0.758	0.546	0.245	0.214	0.834	0.649	0.970	0.241	0.080	0.213

The asterisks denote significant differences: * = $p < 0.05$

OSI: Overall Stability Index, APSI: Anterior/Posterior Stability Index, MLSI: Medial/Lateral Stability Index

measurements or static balance scores. Statistically significant values in the right leg 60^{o/s} isokinetic dynamometer measurements and static balance scores were $r = -0.760$ and $r = -0.650$ in peak torque quadriceps and overall stability and anterior-posterior stability correlations, respectively. (Table 2).

Discussion

Our hypothesis was that there would be large correlations between indicators of balance and strength of the lower extremities. This hypothesis is based on the theory that similar neural mechanisms are involved in the control of balance and strength of the lower extremity. The results of this study can be outlined as follows: (a) in dynamic balance tests, statistically significant correlations were found between the hamstring and quadriceps ratio and Overall Stability Index in the left leg. Similar correlations were found between peak torque of knee flexors (Hamstring) and Anterior-Posterior Stability Index in the right leg; (b) No statistically significant results were found in the static balance test results for the left leg. Statistically significant correlations were found in the peak torque of the knee extensors (quadriceps), the overall stability index, and the anterior-posterior stability index in the right leg. As far as we know, only a few other studies have examined the relationship between static and dynamic balance, isokinetic muscle strength, and H/Q ratio. Thus, other balance and strength studies had to be consulted to discuss the current findings.

One of the studies examining the relationship between H/Q ratio and balance performance was conducted by Wang et al. [11] with 24 female participants aged 22.2 ± 2.8 years. They reported that when the knee joint was located at 15° , the H/Q ratio was significantly correlated with medial-lateral stability index (MLSI) ($p < 0.01$), and overall stability index (OSI) ($p < 0.05$). When the knee joint was flexed at 45° , the H/Q ratio was significantly correlated with anterior-posterior stability index (APSI) and OSI ($p < 0.01$). Similarly et al. [22] investigated whether there was a correlation between knee extensor and flexor isokinetic strength, injury risk, dynamic balance, and jump height in 22 female volleyball players. The results of this study showed that there was a significant correlation between OSI in both dominant and non-dominant legs in the H/Q ratio test performed at $60^\circ \cdot s^{-1}$.

Researchers such as Katayama et al. [23], McCurdy and Langford [24], Thorpe and Ebersole [25] show that lower extremity strength does not have an effect on balance performance. However, in addition to our study, researchers such as Wang et al. [11], Aka and Altundag [26], Ambegaonkar et al. [27] reveal the important relationship between lower extremity muscle strength and balance

performance. Although the physiological basis of this relationship is not fully understood, it is likely to involve neural control of muscle contractions and the mechanics of the musculoskeletal system. What might explain some of the positive correlations found between measures of balance and knee extensor and flexor strength? First, the function of neural processes in course of postural control and strength output appears to be task specific, although similar neurophysiological mechanisms are engaged in the regularization of balance and strength [28, 29]. For example, during isometric dorsal and plantar flexion of the ankle are facilitated short-latency responses induced by transcranial magnetic stimulation [30]. However, these responses remained unchanged during the performance of a reactive balance task in studies examining spinal and corticospinal excitability during the performance of a strength or balance-related task [31]. Second, the literature has reported transfer effects of strength gains following balance training and strength gains following balance training, but the underlying adaptations are task specific [32, 33]. For example, Gruber, Gruber et al. [28] and Gruber et al. [29] examined the effects of four weeks of balance training compared to ballistic strength training on measures of strength using biomechanical and electrophysiological test equipment. After balance and ballistic strength training, the authors reported significant improvements in the maximal rate of force development.

The force required to maintain or regain balance is an important factor in balance performance [34]. There are several mechanisms by which muscle strength can affect balance performance. Strength can improve balance by increasing the stiffness of the body's support structures (muscles, tendons, and ligaments). Muscles work together in groups to provide support and stability to the body, and stronger muscles are better able to support body weight and maintain balance. In addition, stronger muscles can transmit larger signals to the central nervous system, which can increase the accuracy and speed of muscle activation in balance tasks. This may be due to the role of the central nervous system in coordinating muscle activity for balance control. This could improve the ability of stronger athletes to react quickly and maintain their balance in variable environments and improve balance by increasing sensory feedback from the feet and lower limbs to the brain [11, 34].

Conclusions

As a result of this study in dynamic balance tests, statistically significant correlations were found between the H/Q ratio and OSI in the left leg and between peak torque of the hamstring and anterior-posterior stability index (APSI) in the right leg. No statistically significant results were found in static

balance tests in the left leg, while statistically significant correlations were found in peak torque of the quadriceps and OSI and APSI in the right leg. In conclusion, it can be said that muscle strength is an important factor in balance performance based on our study and other sources. However, it should not be ignored that balance is a complex feature involving visual, vestibular, and proprioceptive systems.

Note

This study was produced from the master thesis titled “The Effect of Quadriceps and Hamstring Strength on Balance Performance” published in 2019.

References

- Lesnik B, Sekulic D, Supej M, Esco MR, Zvan M. Balance, Basic Anthropometrics and Performance in Young Alpine Skiers; Longitudinal Analysis of the Associations During Two Competitive Seasons. *Journal of Human Kinetics*, 2017;57(1): 7–16. <https://doi.org/10.1515/hukin-2017-0042>
- Moein E, Movaseghi F. Relationship between some anthropometric indices with dynamic and static balance in sedentary female college students. *Turkish Journal of Sport and Exercise*, 2016;18(1):45–9. <https://doi.org/10.15314/tjse.65406>
- Beard DJ, Kyberd PJ, Fergusson CM, Dodd C. Proprioception after rupture of the anterior cruciate ligament. An objective indication of the need for surgery? *The Journal of Bone and Joint Surgery British Volume*, 1993;75(2):311–5. <https://doi.org/10.1302/0301-620X.75B2.8444956>
- Palmieri RM, Ingersoll CD, Cordova ML, Kinzey SJ, Stone MB, Krause BA. The effect of a simulated knee joint effusion on postural control in healthy subjects. *Archives of Physical Medicine and Rehabilitation*, 2003;84(7):1076–9. [https://doi.org/10.1016/S0003-9993\(03\)00129-1](https://doi.org/10.1016/S0003-9993(03)00129-1)
- Tabrizi HB, Abbasi A, Sarvestani HJ. Comparing the static and dynamic balances and their relationship with the anthropometrical characteristics in the athletes of selected sports. *Middle-East Journal of Scientific Research*, 2013;15(2):216–21. <https://doi.org/10.5829/idosi.mejsr.2013.15.2.7426>
- Nichols DS, Glenn TM, Hutchinson KJ. Changes in the mean center of balance during balance testing in young adults. *Physical Therapy*, 1995;75(8):699–706. <https://doi.org/10.1093/ptj/75.8.699>
- Tatlici A. Comparison of balance performances of athletes from different sports branches. *Turkish Journal of Sport and Exercise*, 2021;23(3):302–5. <https://doi.org/10.15314/tsed.1010699>
- Travis RC. An experimental analysis of dynamic and static equilibrium. *Journal of Experimental Psychology*, 1945;35(3):216. <https://doi.org/10.1037/h0059788>
- Tatlici A, Unlu G, Cakmakci E, Cakmakci O. Investigation of the relationship between strength and dynamic balance performance in elite wrestlers. *Ido Movement for Culture Journal of Martial Arts Anthropology*, 2021;21(3):18–22. <https://doi.org/10.14589/ido.21.3.3>
- Ludwig O, Kelm J, Hammes A, Schmitt E, Fröhlich M. Neuromuscular performance of balance and posture control in childhood and adolescence. *Heliyon*, 2020;6(7):e04541. <https://doi.org/10.1016/j.heliyon.2020.e04541>
- Wang H, Ji Z, Jiang G, Liu W, Jiao X. Correlation among proprioception, muscle strength, and balance. *Journal of Physical Therapy Science*, 2016;28(12):3468–72. <https://doi.org/10.1589/jpts.28.3468>
- Barrack RL, Skinner HB, Buckley SL. Proprioception in the anterior cruciate deficient knee. *The American Journal of Sports Medicine*, 1989;17(1):1–6. <https://doi.org/10.1177/036354658901700101>
- Abulhasan JF, Grey MJ. Anatomy and physiology of knee stability. *Journal of Functional Morphology and Kinesiology*, 2017;2(4):34. <https://doi.org/10.3390/jfmk2040034>
- Blazevich AJ, Coleman DR, Horne S, Cannavan D. Anatomical predictors of maximum isometric and concentric knee extensor moment. *European Journal of Applied Physiology*, 2009;105:869–78. <https://doi.org/10.1007/s00421-008-0972-7>
- Kellis E, Sahinis C, Baltzopoulos V. Is hamstrings-to-quadriceps torque ratio useful for predicting anterior cruciate ligament and hamstring injuries? A systematic and critical review. *Journal of Sport and Health Science*, 2023;12(3): 343–358. <https://doi.org/10.1016/j.jshs.2022.01.002>
- Gribble PA, Hertel J, Denegar CR, Buckley WE. The effects of fatigue and chronic ankle instability on dynamic postural control. *Journal of Athletic Training*, 2004;39(4):321.
- Robbins DW, Goodale TL, Docherty D, Behm DG, Tran QT. The effects of load and training pattern on acute neuromuscular responses in the upper body. *The Journal of Strength & Conditioning Research*, 2010;24(11):2996–3007. <https://doi.org/10.1519/JSC.0b013e3181f67474>
- Gribble PA, Tucker WS, White PA. Time-of-day influences on static and dynamic postural control. *Journal of Athletic Training*, 2007;42(1):35.
- Parraca JA, Adsuar JC, Domínguez-Muñoz FJ, Barrios-Fernandez S, Tomas-Carus P. Test-Retest Reliability of Isokinetic Strength Measurements in Lower Limbs in Elderly. *Biology*, 2022;11(6):802. <https://doi.org/10.3390/biology11060802>
- Arnold BL, Schmitz RJ. Examination of balance measures produced by the biodex stability system. *Journal of Athletic Training*, 1998;33(4):323.
- Cachupe WJ, Shifflett B, Kahanov L, Wughalter

- EH. Reliability of biodex balance system measures. *Measurement in Physical Education and Exercise Science*, 2001;5(2):97–108. https://doi.org/10.1207/S15327841MPEE0502_3
22. Soyly Ç, Altundağ E, Akarçeşme C, Ün Yildirim N. The relationship between isokinetic knee flexion and extension muscle strength, jump performance, dynamic balance and injury risk in female volleyball players. *Journal of Human Sport and Exercise*, 2019;15(3). <https://doi.org/10.14198/jhse.2020.153.03>
23. Katayama Y, Senda M, Hamada M, Kataoka M, Shintani M, Inoue H. Relationship between postural balance and knee and toe muscle power in young women. *Acta Medica Okayama*, 2004;58(4):189–95. <https://doi.org/10.18926/AMO/32087>
24. McCurdy K, Langford G. The relationship between maximum unilateral squat strength and balance in young adult men and women. *Journal of Sports Science & Medicine*, 2006;5(2):282.
25. Thorpe JL, Ebersole KT. Unilateral Balance Performance in Female Collegiate Soccer Athletes. *The Journal of Strength & Conditioning Research*, 2008;22(5):1429–33. <https://doi.org/10.1519/JSC.0b013e31818202db>
26. Aka H, Altundag E. The Relationship between Knee Muscles Isokinetic Strength and Dynamic Balance Performance in Volleyball Players. *International Journal of Applied Exercise Physiology*, 2020;9(9):157–61. <https://doi.org/10.26655/IJAEP.2020.9.1>
27. Ambegaonkar JP, Mettinger LM, Caswell SV, Burt A, Cortes N. Relationships between core endurance, hip strength, and balance in collegiate female athletes. *International Journal of Sports Physical Therapy*, 2014;9(5):604.
28. Gruber M, Gruber SB, Taube W, Schubert M, Beck SC, Gollhofer A. Differential effects of ballistic versus sensorimotor training on rate of force development and neural activation in humans. *The Journal of Strength & Conditioning Research*, 2007;21(1):274–82. <https://doi.org/10.1519/00124278-200702000-00049>
29. Gruber M, Taube W, Gollhofer A, Beck S, Amtage F, Schubert M. Training-specific adaptations of H-and stretch reflexes in human soleus muscle. *Journal of Motor Behavior*, 2007;39(1):68–78. <https://doi.org/10.3200/JMBR.39.1.68-78>
30. Morita H, Olivier E, Baumgarten J, Petersen N, Christensen L, Nielsen J. Differential changes in corticospinal and Ia input to tibialis anterior and soleus motor neurones during voluntary contraction in man. *Acta Physiol Scand*. 2000;170(1):65–76. <https://doi.org/10.1046/j.1365-201x.2000.00762.x>
31. Taube W, Schubert M, Gruber M, Beck S, Faist M, Gollhofer A. Direct corticospinal pathways contribute to neuromuscular control of perturbed stance. *Journal of Applied Physiology*, 2006;101(2):420–9. <https://doi.org/10.1152/jappphysiol.01447.2005>
32. Granacher U, Gollhofer A, Kriemler S. Effects of balance training on postural sway, leg extensor strength, and jumping height in adolescents. *Research Quarterly for Exercise and Sport*, 2010;81(3):245–51. <https://doi.org/10.1080/02701367.2010.10599672>
33. Granacher U, Gruber M, Gollhofer A. Resistance training and neuromuscular performance in seniors. *International Journal of Sports Medicine*, 2009;30(09):652–7. <https://doi.org/10.1055/s-0029-1224178>
34. Pereira MP, Gonçalves M. Proprioceptive neuromuscular facilitation improves balance and knee extensors strength of older fallers. *International Scholarly Research Notices*, 2012;2012. <https://doi.org/10.5402/2012/402612>

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Integration of project based learning models with interactive multimedia: Innovative efforts to improve student breaststroke swimming skills

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Abstract

Background and Study Aim Breaststroke swimming is one of the compulsory subjects for students majoring in sports education at Lambung Mangkurat University. Thus, it is important to have good breaststroke swimming skills so that later it will become the basis for creating experienced and potential teachers. Therefore, there is a need for special treatment to improve breaststroke swimming skills. This study aims to provide evidence of the integration of project based learning models with interactive multimedia on improving students' breaststroke swimming skills.

Material and Methods This research is a quasi-experimental type with a pretest posttest non-equivalent control group design. The sampling technique used purposive sampling so that as many as 90 sports education students were sampled, namely 45 experimental groups and 45 control groups. The instrument resulting from breaststroke swimming skills was designed by the researcher, based on the theory of swimming experts, all descriptors for the breaststroke swimming instrument totalled 35 items. Furthermore, the analysis of the data in this study through the stages of normality test, homogeneity test, and hypothesis testing.

Results The hypothesis test on the experimental group indicator with the PBL-Multimedia Interactive treatment showed a significance value of $0.000 < 0.05$ which means it is significant. Furthermore, the results on the control group indicator showed a significance value of $0.000 < 0.05$, so there was a significant increase. The results also show a difference with a significance of $0.001 < 0.05$, which means that the PBL- Multimedia Interactive experimental group and the control group (Conventional) have a significant difference in the effect on the posttest score.

Conclusions This study shows that the PBL-Multimedia Interactive model integration treatment has a significant effect on improving students' breaststroke swimming skills. Where the integration of the PBL-Multimedia Interactive model is proven to be more effective than the conventional model. That way, the integration of the PBL-Multimedia Interactive model is effective and can be applied in swimming learning, especially in improving breaststroke swimming.

Keywords: learning model, project based learning, interactive multimedia, swimming breaststroke

Introduction

Sport is a physical activity that can be carried out by various groups [1]. Along with its development, technological advances in sports coaching are needed [2]. Where technological advances are increasingly sophisticated and modern, so that they are very close to digital devices both online and offline [3]. Therefore, the rapid development of various technologies gives hope for the modernization of new technologies in the world

of education [4], including reforms in the world of sports [5]. In addition, models and media that are currently developing rapidly cause various demands and lifestyle changes, including sports, especially swimming [6].

Swimming is a sport that is done in water [7], and all levels of society can do this sport regardless of age and gender [8], and it is one of the most popular sports in the world [9]. Swimming activity is an important resource so as not to drown [10], besides that it also requires good and prime physical condition. Thus, physical fitness is also maintained [11, 12, 13, 14, 15], which is related to physical

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health [16, 17, 18]. A study based on the results of clinical trials showed that swimmers found specific improvements in lung function [19]. The results of this review have provided an illustration that swimming is a very important water sport, both for physical abilities and health-related fitness. However, special attention is needed as said by Pharr et al that few studies have an understanding of predictors of swimming ability. There are various styles in swimming, one of which is the breaststroke [10].

Breaststroke swimming or what is often known as frog style is a swimming style facing the surface of the water, where the legs are moved outwards like kicking backwards. The movement starts from the first arm swing after sliding and the body must remain face down and both shoulders parallel to the surface of the water [20]. In addition, the breaststroke becomes the only competitive stroke [21], and the complex is also characterized by an intermittent propulsion phase [22]. A study by Strzala says that success in breaststroke swimming turns out that most of the power is reinforced by the kicking motion of the breaststroke and is considered the most responsible [23]. Therefore, it is very important to coordinate limb movements optimally for swimmers, this aims to maintain the best possible speed [21]. In addition, breaststroke swimming is a compulsory subject for students majoring in sports education at the Teaching and Education Faculty (FKIP) of Lambung Mangkurat University. Where the existence of swimming practice courses is the basis for the creation of experienced and potential teachers, thus providing an important role in the community environment.

Implementation of breaststroke swimming practice lectures to students by providing basic technical practice materials and swimming skills based on contracts and lecture teaching materials. Thus students are required to be able to do and practice breaststroke swimming, this is intended for preparation after graduating from university later. Therefore, to obtain maximum results, it is necessary to have a learning design so that it is not monotonous [24–28]. Where sports teachers are also a consideration in seeing student success [29]. Furthermore, harnessing the advancement of technology in a few decades may be an option to replace the traditional way [3]. The solutions offered use a project-based learning model with interactive multimedia, this is also considered in line with technological advances and their use in the world of sports. As is the case with what was said Jumaat & Tasir that sports science and technology needs appreciation, especially for coaches in Indonesia [2]. The results are the same as research conducted by Widiastuti & Mashud interactive multimedia developed will facilitate swimming training and is feasible to implement [3, 30].

Although previously Sugiyanto research had been carried out on the integration of mobile learning and project-based learning [31], and Haryanto innovation media learning, online project-based learning (O-PBL) [32]. However, researchers have not found research on the integration of project-based learning models with interactive multimedia in physical education, especially those that discuss breaststroke swimming. So that this can be a research update and strengthen the importance of this research to be carried out. That way, this research will be able to contribute to the strategies and learning models used. In his research Saeed applying multimedia provides an advantage in the learning process [33]. Based on these problems, this study aims to provide evidence of the integration of project-based learning models with interactive multimedia to improve students' breaststroke swimming skills.

Materials and Methods

Participants

This research will be conducted in a swimming pool located on the main campus of the Department of Sports and Health Education, Teaching and Education Faculty, Lambung Mangkurat University from September 2022 to November 2022. The researchers determined the sample in this study using purposive sampling with a total sample of 90 students, namely 45 experimental groups and 45 control groups.

Research Design

The effectiveness model used in this study is experimental. The method used is a quasi-experimental design with pretest posttest non-equivalent control group design. In this method given different treatment in the experimental group and the control group. In this study the experimental class will be treated with a project based learning model with interactive multimedia while the control class will be treated with a conventional learning model. This study was initiated by administering a pretest to the experimental and control groups, then the experimental group was given a project based learning model treatment with interactive multimedia for 8 meetings. Then a posttest was given to the experimental and control groups to see the effect of the treatment on the experimental group.

The instrument for the results of breaststroke swimming skills was designed by researchers, based on the theory of swimming experts. Especially for the breaststroke swimming instrument, it is divided into: 1) concept; 2) breaststroke swimming indicator; and 3) descriptors (description of indicators). The concept is breaststroke swimming which is divided into 7 (seven) indicators, such as: 1) start; 2) body position; 3) leg movements; 4) arm movement and

recovery; 5) breath movement; 6) coordination movement; and 7) reversal movement. Of the 7 (seven) indicators, each is further divided into 5 descriptors. So the total number of descriptors for the breaststroke swimming instrument is 35 items. It is from these 35 descriptor items that the tests scores are obtained.

In order to find out whether the instrument used was feasible, testers 1 and 2 were first tested with a sample of 15 students of the Physical Education Study Program. Where the results show for $n = 15$ and an error rate of 5%, it is obtained $r_{table} = 0.514$ and an error level of 1% $r_{table} = 0.641$, because r_{count} is greater than r_{table} ($0.966 > 0.641 > 0.514$), it can be concluded that the swimming ability instrument reliable.

Statistical Analysis

The research data was analyzed in a quantitative descriptive manner to provide a summary of research data and to facilitate the presentation of research data. Data showing normal distribution were analyzed using the t test to test the difference in the average pretest and posttest results in the

experimental group and the control group, as well as the significance assisted using the SPSS 26 application.

Results

Quasi-experimental research, such as the existence of different treatments in the experimental group and the control group. In this study the experimental group was treated with a project based learning model with interactive multimedia (PBL-interactive multimedia) and the control group (Conventional). Before being given the effect test and the different test, first carry out the normality prerequisite test, if the data is normal, it will use the t-test and if it is not normal, it will proceed with the nonparametric test.

Based on the results of the normality test with the Kolmogorov-Smirnov formula, it shows that the significance value is $p > 0.05$, so in conclusion the data shows normal, then the t-test will be continued. The results of the normality test can be seen in table 1.

The results in table 2 of the hypothesis test on the indicators of the experimental group

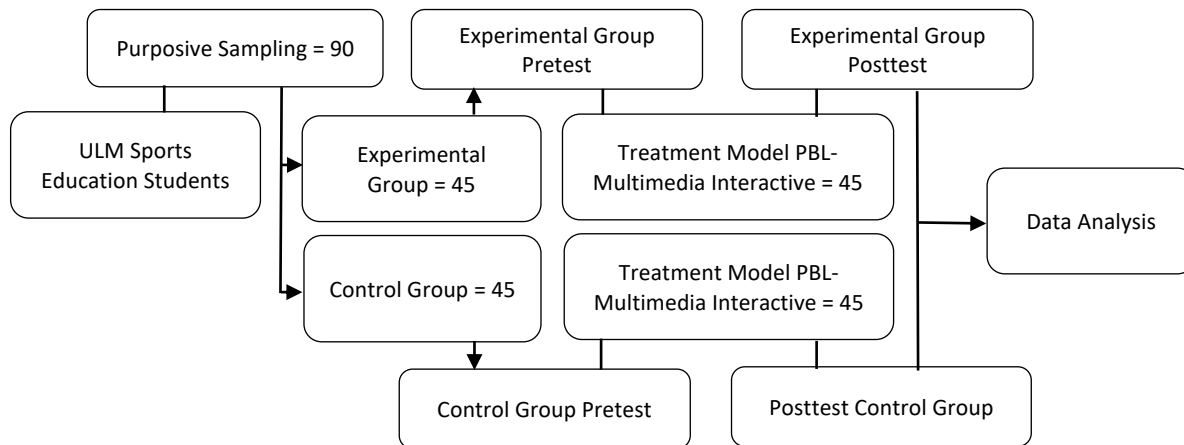


Figure 1. Chart of research procedures

Table 1. Kolmogorov-Smirnov normality prerequisite test

Result	Statistics	df	Sig.
Experiment Pretest	0.097	45	.200 *
Posttest Experiment	0.117	45	.144
Pretest Control	0.107	45	.200 *
Posttest Control	0.118	45	.129

Table 2. Paired samples test results of the t-test

Pairs	Result	Means	std. Deviation	t	df	Sig. (2-tailed)
Pair 1	Experimental Pretest - Experimental Posttest	-6.467	3.653	-11.875	44	0.000
Pair 2	Pretest Control - Posttest Control	-3.089	3.502	-5.917	44	0.000

with the PBL-Multimedia Interactive treatment show a significance value of $0.000 < 0.05$, so these results provide evidence that the PBL-multimedia interactive model provides a significant increase in the results of breaststroke swimming skills.

Furthermore, the control group showed a significance value of $0.000 < 0.05$, so these results also provide evidence that the conventional model actually provides a significant increase in the results of breaststroke swimming skills. Based on the results of the analysis of hypothesis testing, it can be concluded that the PBL-interactive multimedia model and the conventional model can be applied to improve breaststroke swimming skills. Seeing these results, the researcher wants to see the difference in the effect given, so that the model can be proven more effective to use.

Based on the results of the homogeneity test, it shows a significance value of $0.085 > 0.05$, so the result is homogeneous, then it will be followed by a different test with the Independent Samples t Test formula. The normality test results can be seen in table 3.

The results in table 4 to find out the difference in the pre-test scores of the experimental group and

the pre-test of the control group, the results show a significance value of $0.912 > 0.05$ so there is no significant difference in the pre-test of the PBL-Multimedia Interactive experimental group with the pre-test control group (Conventional).

The results in table 4 to find out the difference in the pre-test values of the experimental group and the pre-test of the control group, the results show a significance value of $0.001 < 0.05$, so the post-test of the PBL-Multimedia Interactive experimental group and the post-test of the control group (Conventional) there is a difference significant influence. Based on these results, it proves that the PBL-Multimedia Interactive model is more effective than the conventional learning model (tabl.5). So the PBL-Multimedia Interactive model is more recommended to improve breaststroke swimming skills.

Based on table 6 it can be seen that the minimum, maximum, mean, and standard deviation on pretest and posttest data with PBL-Multimedia Interactive model treatment proves that the posttest scores are better, but the difference is not too big. For more details can be seen in Figure 2.

Table 3. Test of homogeneity of variances

Learning	Result	Levene Statistics	df1	df2	Sig.
Breaststroke Swimming	Based on Means	2.240	3	176	0.085

Table 4. Difference test of experimental pre-test (PBL-multimedia interactive) and control pre-test

Results	Group	F	Sig.	t	df	Sig. (2-tailed)
Swimming breaststroke	Experimental Pre-test and Control Pre-test	0.282	0.596	0.111	88	0.912

Table 5. Difference test of experimental post-test (PBL-multimedia interactive) and control post-test

Result	Group	F	Sig.	t	df	Sig. (2-tailed)
Swimming breaststroke	Experimental Post-test and Control Post-test	0.266	0.607	3.408	88	0.001

Table 6. Descriptive analysis of pre-test and post-test data on breaststroke swimming ability results

Group	N	Minimum	Maximum	Means	std. Deviation
Pre-test Experiment	45	4	35	20.04	6.759
Post-test Experimental	45	15	35	26.51	4.888
Pre-test Control	45	6	29	19.89	6.516
Post-test Control	45	10	32	22.98	4.947

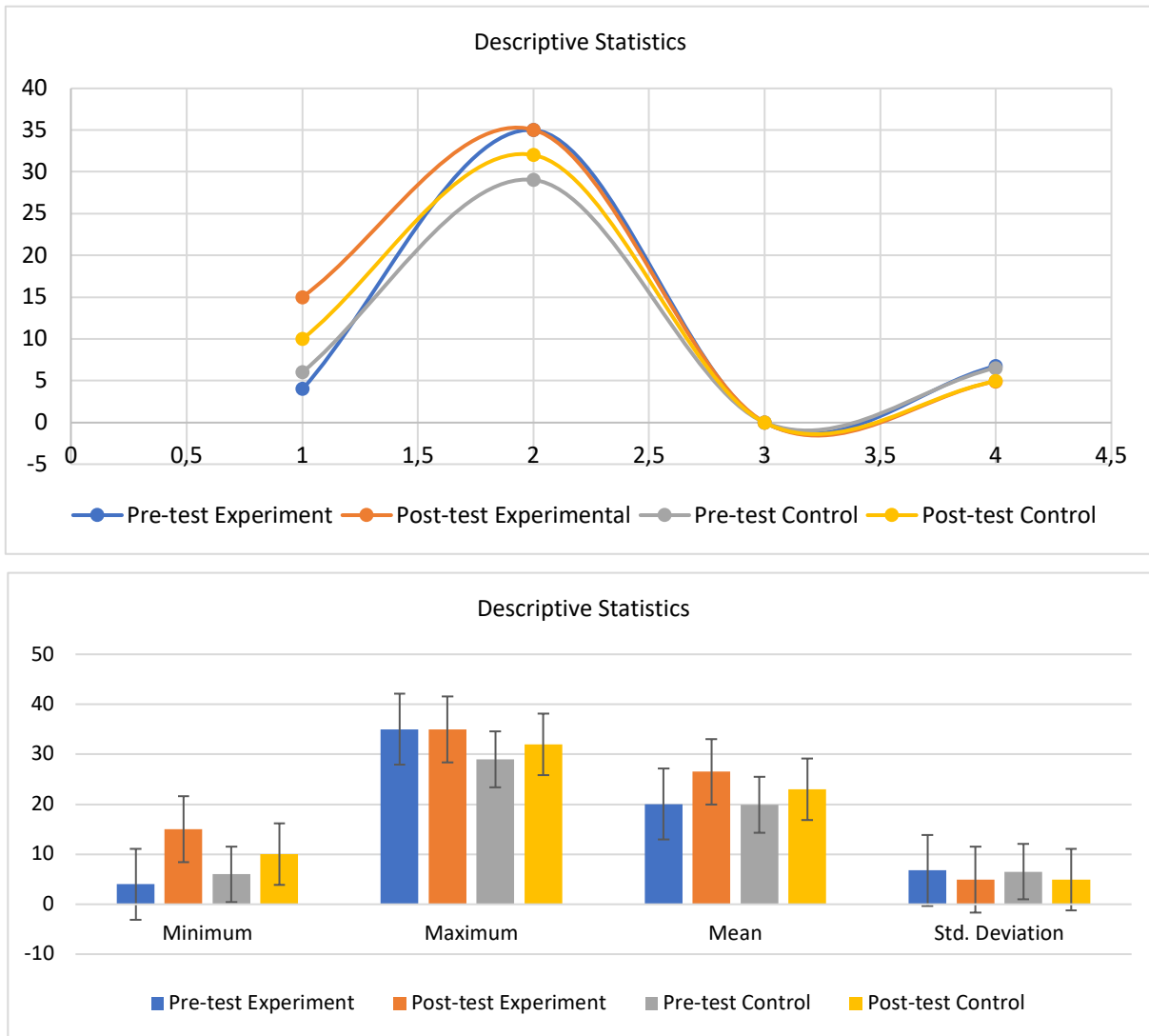


Figure 2. Descriptive data of pre-test and post-test of breaststroke swimming ability

Discussion

This study aims to provide evidence of the effect of integrating project-based learning models with interactive multimedia on improving students' breaststroke swimming skills. The results showed that the average value of the posttest experimental group (26.51) and the control group (22.98) was greater than the pretest value of the experimental group (20.04) and the control group (19.89). Furthermore, the result of the calculated t value is greater than t table, and the results also show significant. From these results it can be concluded that the PBL-Multimedia Interactive model and the conventional model show a significant increase in the learning outcomes of breaststroke swimming. Previous research by Sugiyanto provides evidence that the Integration of Mobile Learning and Project Based Learning has an increasing effect on the competency of vocational high schools [31]. Furthermore, it has been proven that media-based online project-based learning is appropriate for use

in automotive engineering drawing subjects [32].

Other studies have found that swimming skills can also be improved by doing swimming exercises for 33 weeks, and have a positive effect on health [33, 34]. In addition, providing special training to swimmers can improve performance during competitions [35]. Research by Gülbin that the performance of male swimmers is also influenced by using core training, where this exercise has a positive effect [36]. Several studies have shown that playing approaches, authoritarian teaching styles, and democratic influences affect students' swimming abilities [37, 38]. To improve safety skills in swimming, you can apply traditional swimming teaching, but do not reduce student drowning injuries [39]. Subsequent studies, to improve performance in swimming do more strength training [40].

The results of the study also show the difference in the influence of the PBL-Multimedia Interactive model and the conventional model, where the PBL-Multimedia Interactive model is more effective. These results are reinforced by Susena proving

that swimming based on interactive multimedia applications shows very good criteria [7]. A study has proven that multimedia-based swimming learning provides an increase in backstroke swimming [33], and multimedia learning proves its superiority compared to learning without multimedia. The results of this study are reinforced by Widiastuti that with the existence of a learning model with interactive multimedia that is being developed [3], it is hoped that it can be an alternative to conventional methods. Based on this review, it reaffirms the application of interactive multimedia-based learning, where this is done following increasingly advanced technological developments. In this way, the results of research on the integration of project-based learning models with interactive multimedia can also be considered as a learning model that utilizes technological advances in the field of sports.

Conclusions

The results of the research and discussion have a strong foundation related to the Interactive PBL-Multimedia model, on the basis of references from the research listed previously in the discussion of results and discussion. Where these findings have resulted in several conclusions. The results of the study prove that the PBL-Multimedia Interactive model and the conventional model have a significant effect on improving students' breaststroke

swimming skills. These findings also show a significant difference between the Interactive PBL-Multimedia model and the conventional model, namely the Interactive PBL-Multimedia model is more effective for improving breaststroke swimming skills. The results of this study have provided a new reference related to breaststroke swimming practice learning, and added evidence that the integration of project-based learning models with interactive multimedia is more advisable to improve swimming skills, especially breaststroke. The weakness of the research lies in the activities and warm-up carried out by students before the final test is carried out. In addition, the physical condition of students who are not fully monitored is also one of the research weaknesses. Recommendations for further research can apply the PBL-Multimedia Interactive model to other swimming skills, it is known that swimming is popular with 4 styles namely freestyle, butterfly, backstroke and breaststroke.

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Conflict of interest

There is no conflict of interest.

References

- Suryadi D, Gustian U, Fauziah E. The Somatotype of Martial Athletes in the Fighter Category Against Achievement. *JUARA J Olahraga*. 2022;7(1):116–25. <https://doi.org/10.33222/juara.v7i1.1484>
- Jumaat NF, Tasir Z. Integrating Project Based Learning Environment into the Design and Development of Mobile Apps for Learning 2D-Animation. *Procedia - Soc Behav Sci*. 2013;103(26):526–33. <https://doi.org/10.1016/j.sbspro.2013.10.369>
- Widiastuti W, Sulaiman I, Susilo S, Hernawan H, Mashud M, Solahuddin S, et al. Interactive multimedia development for swimming learning and training. *IOP Conf Ser Mater Sci Eng*. 2021;1098:1–6. <https://doi.org/10.1088/1757-899x/1098/3/032038>
- Zeng Q. Research on Multimedia Swimming Teaching under Informatization. In: *Proceedings - 2020 International Conference on Computers, Information Processing and Advanced Education, CIPAE 2020*. 2020. P. 60–63. <https://doi.org/10.1109/CIPAE51077.2020.00023>
- Félix ER, da Silva HP, Olstad BH, Cabri J, Correia PL. Swimbit: A novel approach to stroke analysis during swim training based on attitude and heading reference system (ahrs). *Sports*. 2019;7(11):238. <https://doi.org/10.3390/sports7110238>
- de Zeeuw M, Smolianov P, Dion S, Schoen C. Comparing the practices of Dutch swimming against a global model for integrated development of mass and high performance sport. *Manag Sport Leis*. 2017;22(2):91–112. <https://doi.org/10.1080/23750472.2017.1394797>
- Susena SJ, Sugiharto S, Kusuma DWY. Development of Swimming Learning Media Based on Interactive Multimedia Applications Through Computers and Smartphones. *J Phys Educ Sport*. 2021;10(2):156–64. <https://doi.org/10.15294/JPES.V10I2.46269>
- Usra M. Swimming Learning Model Using Rope As Aid For Beginners. In: *Proceedings of the First Indonesian Communication Forum of Teacher Training and Education Faculty Leaders International Conference on Education 2017 (ICE 2017)*. 2018. P. 388–93. <https://doi.org/10.2991/ice-17.2018.83>
- Khodae M, Edelman GT, Spittler J, Wilber R, Krabak BJ, Solomon D, et al. Medical Care for Swimmers. *Sports Medicine - Open*. 2016;2(1): 27. <https://doi.org/10.1186/s40798-016-0051-2>
- Pharr J, Irwin C, Layne T, Irwin R. Predictors of swimming ability among children and adolescents in the United States. *Sports*. 2018;6(1):1–11. <https://doi.org/10.3390/sports6010017>
- Baek KW, Lee MC, Jeon TB, Yoo J II, Park JS, Moon HY, et al. Effects of exercise on physical fitness and strength according to the frailty level of female elderly with hypertension. *Exerc Sci*. 2020;29(4):368–76. <https://doi.org/10.15857/ksep.2020.29.4.368>
- González-Fernández FT, González-Villora S,

- Baena-Morales S, Pastor-Vicedo JC, Clemente FM, Badicu G, et al. Effect of Physical Exercise Program Based on Active Breaks on Physical Fitness and Vigilance Performance. *Biology*, 2021;10(11): 1151. <https://doi.org/10.3390/biology10111151>
13. Suryadi D, Samodra YTJ, Purnomo E. Efektivitas latihan weight training terhadap kebugaran jasmani [The effectiveness of weight training exercises on physical fitness]. *J RESPECS*. 2021;3(2):9–19. (In Indonesian). <https://doi.org/10.31949/respects.v3i2.1029>
 14. Rubiyatno, Perdana RP, Fallo IS, Arifin Z, Nusri A, Suryadi D, et al. Analysis of differences in physical fitness levels of extracurricular futsal students: Survey studies on urban and rural environments. *Pedagog Phys Cult Sport*. 2023;27(3):208–14. <https://doi.org/10.15561/26649837.2023.0304>
 15. Suryadi D, Suganda MA, Sacko M, Samodra YTJ, Rubiyatno R, Supriatna E, et al. Comparative Analysis of Soccer and Futsal Extracurriculars: A Survey Study of Physical Fitness Profiles. *Phys Educ Sport Stud Res*. 2023;2(1):59–71. <https://doi.org/10.56003/pessr.v2i1.182>
 16. Suryadi D. Analisis kebugaran jasmani siswa: Studi komparatif antara ekstrakurikuler bolabasket dan futsal [Analysis of students' physical fitness: Comparative study between basketball and futsal extracurriculars]. *Edu Sport Indones J Phys Educ*. 2022;3(2):100–10. (In Indonesian). [https://doi.org/10.25299/es:ijope.2022.vol3\(2\).9280](https://doi.org/10.25299/es:ijope.2022.vol3(2).9280)
 17. Suryadi D, Rubiyatno. Kebugaran jasmani pada siswa yang mengikuti ekstrakurikuler futsal [Physical fitness of students who take part in extracurricular futsal]. *J Ilmu Keolahragaan*. 2022;5(1):1–8. (In Indonesian). <https://doi.org/10.26418/jilo.v5i1.51718>
 18. Samodra YTJ, Suryadi D, Wati IDP, Supriatna E, Santika IGPNA, Suganda MA, et al. Analysis of gross motoric analysis of elementary school students: A comparative study of students in hill and coastal areas. *Pedagog Phys Cult Sport*. 2023;27(2):139–145. <https://doi.org/10.15561/26649837.2023.0206>
 19. Päivinen M, Keskinen K, Tikkanen H. Swimming-induced changes in pulmonary function: special observations for clinical testing. *BMC Sports Science, Medicine and Rehabilitation*, 2021;13(1): 55. <https://doi.org/10.1186/s13102-021-00277-1>
 20. Abdul Gani R, Setiawan E, Jumareng H, Unju Subandi O. Implementation Of Modification Game Methods To Improve Breaststroke Swimming Skills. *Hal Olahraga Nusant (Jurnal Ilmu Keolahragaan)*. 2021;4(2):255–70. <https://doi.org/10.31851/hon.v4i25404>
 21. Nicol E, Adani N, Lin B, Tor E. The temporal analysis of elite breaststroke swimming during competition. *Sports Biomechanics*, 2021; 1–13. <https://doi.org/10.1080/14763141.2021.1975810>
 22. Nicol E, Pearson S, Saxby D, Minahan C, Tor E. Stroke kinematics, temporal patterns, neuromuscular activity, pacing and kinetics in elite breaststroke swimming: A systematic review. *Sport Med - Open*. 2022;8(1):1–24. <https://doi.org/10.1186/s40798-022-00467-2>
 23. Strzała M, Kręzałek P, Kaca M, Głab G, Ostrowski A, Stanula A, et al. Swimming Speed of The Breaststroke Kick. *Journal of Human Kinetics*, 2012;35(1): 133–139. <https://doi.org/10.2478/v10078-012-0087-4>
 24. Suryadi D, Samodra YTJ, Gustian U, Yosika GF, B PS, Dewintha R, et al. Problem-based learning model: Can it improve learning outcomes for long serve in badminton. *Edu Sport Indones J Phys Educ*. 2023;4(1):29–36. [https://doi.org/10.25299/es:ijope.2023.vol4\(1\).10987](https://doi.org/10.25299/es:ijope.2023.vol4(1).10987)
 25. Suryadi D, Saputra E, Wahyudi I. Tinggi Badan dan Keseimbangan Dinamis dengan Kemampuan Lay Up Permainan Bola Basket: Apakah Saling Berhubungan? [Height and Dynamic Balance with Lay Up Ability in Basketball: Are They Related?]. *Indones J Phys Educ Sport Sci*. 2022;2(2):67–74. (In Indonesian). <https://doi.org/10.52188/ijpess.v2i2.276>
 26. Rubiyatno R, Suryadi D. Penerapan Media Audio Visual Dalam Meningkatkan Hasil Belajar Servis Bulutangkis di MTs Mujahidin Pontianak [Application of Audio Visual Media in Improving Badminton Service Learning Outcomes at MTs Mujahidin Pontianak]. *Musamus J Phys Educ Sport*. 2022;4(2):140–9. (In Indonesian). <https://doi.org/10.35724/mjpes.v4i02.4303>
 27. Hardinata R, Yosika GF, Haïdara Y, Perdana RP, Gustian U, Suryadi D, et al. Project Based Learning Model: Can It Improve Dribbling Skills In Soccer Games? *Indones J Phys Educ Sport Sci*. 2023;3(1):69–80. <https://doi.org/10.52188/ijpess.v3i1.387>
 28. Perdana RP, Supriatna E, Yanti N, Suryadi D. Team Game Tournament (TGT)-type cooperative learning model: How does it affect the learning outcomes of football shooting? *Edu Sport Indones J Phys Educ*. 2023;4(1):86–96. [https://doi.org/10.25299/es:ijope.2023.vol4\(1\).12130](https://doi.org/10.25299/es:ijope.2023.vol4(1).12130)
 29. Haïdara Y, Okilanda A, Dewintha R, Suryadi D. Analysis of students' basic basketball skills: A comparative study of male and female students. *Tanjungpura J Coach Res*. 2023;1(1):1–5. <https://doi.org/10.26418/tajor.v1i1.63796>
 30. Mashud M, Tangkudung J, Widiastuti W. Swimming Lesson Based on Interactive Multimedia. *Int J Sport Sci*. 2018;8(3):91–6. <https://doi.org/10.5923/j.sports.20180803.04>
 31. Sugiyanto, Setiawan A, Hamidah I, Ana A. Integration of mobile learning and project-based learning in improving vocational school competence. *J Tech Educ Train*. 2020;2. <https://doi.org/10.30880/jtet.2020.12.02.006>
 32. Haryanto, Kusuma WM, Mutohharri F, Nurtanto M, Suyitno S. Innovation Media Learning: Online Project-Based Learning (O-PBL) on Drawing Competence in Automotive Engineering Using Video on YouTube. *Journal of Physics: Conference Series*, 2021;2111(1): 012020. <https://doi.org/10.1088/1742-6596/2111/1/012020>
 33. Saeed OA. The impact and clarity of presentation using multimedia learning system in the learning of swimming of back among students Specialized

- schools. *Sci J Phys Educ.* 2016;9(3):1–16. <https://www.iasj.net/iasj/article/125482>
34. Naczk A, Gajewska E, Naczk M. Effectiveness of swimming program in adolescents with down syndrome. *Int J Environ Res Public Health.* 2021;18(14):7441. <https://doi.org/10.3390/ijerph18147441>
35. Pupiřová Z, Pupiř M, Sykora J, Brunn D, Giniřová J, Pavlović R. The impact of a specific training programme on the selected parameters of swimming turns. *Turkish J Kinesiol.* 2019;5(1):36–42. <https://doi.org/10.31459/turkjin.511533>
36. Gülbin C, Mardin E, Üniversitesi A, Gül M, Gül GK, Gülbin Eskiyecek C, et al. The Effect of 8-Week Core Exercises Applied to 10-12 Age Male Swimmers on Swimming Performance. *International J Appl Exerc Physiol.* 2020;9(3):213–20.
37. Nosko M, Arkhypov O, Khudolii O, Filatova Z, Yevtushok M. Pedagogical Conditions for Swimming Skills Development in Students of Pedagogical Educational Institutions. *Rev Rom pentru Educ Multidimens.* 2019;11(2):240. <https://doi.org/10.18662/rrem/127>
38. Lenneis V, Agergaard S, Evans AB. Women-only swimming as a space of belonging. *Qual Res Sport Exerc Heal.* 2022;14(1):37–52. <https://doi.org/10.1080/2159676X.2020.1844790>
39. Zhang S, Dai J, Nie Z. Can Swimming Teaching Prevent Drowning? An Experimental Study of Children in China. *Discret Dyn Nat Soc.* 2022;2022:1–8. <https://doi.org/10.1155/2022/6141342>
40. Fone L, Van Den Tillaar R. Effect of Different Types of Strength Training on Swimming Performance in Competitive Swimmers: A Systematic Review. *Sports Medicine - Open.* 2022;8(1):19. <https://doi.org/10.1186/s40798-022-00410-5>

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Researching the future expectations of sports sciences students

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Abstract

Background and Study Aim As the field of sports science continues to evolve rapidly, understanding students' aspirations is crucial for adapting educational programs accordingly. Furthermore, gaining insights into their future expectations can aid in addressing emerging trends and demands within the sports industry. The aim of the research is to examine how the future expectations of sports science students change at the end of their education life.

Material and Methods The study focused on sports science students in Turkey, with a sample size of 130 students selected randomly. These students willingly participated in the research, and their pre-test and post-test scores were compared using a standardized scale to evaluate changes in their perceptions and expectations. The collected data were analyzed using the SPSS program. To examine potential differences among variables within the research group, the Man Whitney U test was utilized for dependent groups, while the Kruskal Wallis H test was applied to assess multiple differences between groups. A significance level of $p < 0.05$ was established.

Results The research revealed a significant difference in the pre-test results solely based on the educational status of the sports science students' mothers and fathers. Moreover, notable variations were observed in the average differences between pre-test and post-test scores concerning the students' departments and age. However, no significant differences were found in the future expectations of sports science students when considering gender, age, department, and income status variables. Notably, there was a significant difference favoring undergraduate students in terms of their mother's and father's education status variables. Furthermore, the mean scores of the pre-test and post-test demonstrated a significant difference between the age groups of 17-18 and those aged 21 and above. Additionally, significant differences were observed between students in the "Sports Management" department and those in the "Coaching" department, favoring the latter.

Conclusions The study emphasizes that gender, age, department, and income status did not significantly impact the future expectations of sports science students. However, it is crucial to address the educational needs of undergraduate students and the variations in scores among different age groups and departments to better cater to their career aspirations and development.

Keywords: sports, future expectation, sports science students

Introduction

The opportunities, career prospects, and expectations for personal development that young people will encounter during and after university education have become a topic of general interest in society. University students express their hopes and concerns for the future, and this issue holds great importance for policymakers, the business world, and academic circles alike [1]. Additionally, many university students aim to build a successful career and attain financial security in the future [2]. However, the changes observed in traditional fields of work, technological advancements, and digital transformation have led students to reassess their career plans. The emergence of new industries and changes in the business world require students to possess more flexible and versatile skills. Therefore, university students are focusing on enhancing

their technological proficiency, developing entrepreneurial skills, and adapting to the evolving business world [3].

Future expectations, while being proportional to an individual's degree of anticipation for an event, also guide development as they influence goal setting and planning behaviors [4, 5]. In this regard, future expectations can be considered as determinant factors in shaping people's lives. When we specifically focus on the concept of future expectations for young individuals, it has been selected as the main theme in this study due to its impacts on long-term plans that are crucial for the future, such as educational goals, job opportunities, social and emotional adjustment in school, and perceived competence [6]. This is because during this period, young men and women strive to acquire various adult roles and responsibilities, including exploring relationships, participating in social networks, keeping up with employment opportunities, and negotiating life responsibilities [7].

Future expectations have been significant determinants of youth development and behavior [8]. After adolescence, many young individuals begin to develop more concrete plans and expectations for their future lives. They explore university education and careers, start working part-time, and strive to achieve economic income [9]. As a result, future expectations can have different effects on each young person. For instance, from a theoretical perspective, beliefs that the future is unpredictable and uncontrollable tend to discourage future orientation and promote erroneous evaluations of outcomes and risks. This, in turn, can lead young people to engage in various risky behaviors, focus on impulsive actions, resist delaying gratification, and seek excitement [10]. Considering the potential for different scenarios, identifying young people's future expectations can be targeted to promote societal health and psychological well-being.

Research indicates that university students generally focus on factors such as a stable career, job security, and financial stability [11]. However, future expectations for university students are not limited to just work and career. Many students also consider lifestyle choices and personal happiness [12]. Students may have goals related to starting a family, traveling, and personal development [13]. However, studies also show that students have concerns about their future financial security and economic well-being [14]. Therefore, university students often shape their career choices based on their future financial goals and lifestyle preferences.

Other studies have shown that students' future expectations, which involve their predictions about what will happen to them in important aspects of life, are associated with their subsequent school adjustment [15, 16, 17]. However, limited research has examined changes in future expectations of sports science students based on demographic factors such as gender, age, field of study, various income groups, parents' educational background, and self-identification.

This study aims to examine the future expectations of students studying sports science in different departments during their enrollment and graduation years.

Research Questions:

- What is the level of future expectations among sports science students in the first year of their academic studies?
- What is the level of future expectations among sports science students in the final year of their academic studies?
- What differences exist in the future expectations of sports science students between the first and final years of their academic studies?

Materials and Methods

Participants

The population of the study consists of sports science students in Turkey, while the sample consists of 130 students who were selected through simple random sampling and voluntarily participated in the research. The participants are students enrolled in the Hasan Doğan School of Physical Education and Sports at Karabük University between the years 2018-2022. The research includes students from the departments of Teaching, Coaching, and Sports Management. The study is limited to 1st-year students of the fall semester of the 2018-2019 academic year and 4th-year students of the spring semester of the 2021-2022 academic year at the Hasan Doğan School of Physical Education and Sports, Karabük University. The research has been supported by the Karabük University Social and Human Sciences Ethics Board with the ethical board decision number E-78977401-050.02.04-237290, dated 29.03.2023.

Research Design

The research is designed using a quantitative research model, specifically the correlational survey model. The data was collected by the researchers in a classroom setting. Pre-tests were administered to 1st-year students in the departments of Teaching, Coaching, and Sports Management before the class, and post-tests were conducted with the same students who reached the 4th year after a four-year educational process, also in a classroom setting. It took approximately 4 minutes for each participant to complete the questionnaire.

Data Collection Instrument

The research data was collected using a personal information form developed by the research team, which included descriptive information such as gender, age, department, income status, mother's education level, father's education level, and mood. In addition, the "Future Expectations" scale developed by Tuncer [18] was used. Initially, the scale consisted of 17 items, but based on expert opinions and factor analysis, two items were removed, resulting in a 14-item scale [18]. The scale was designed using a five-point Likert scale, with scoring ranging from "Strongly Disagree (1.00-1.79)" to "Strongly Agree (4.20-5.00)".

Statistical Analysis

Descriptive statistical methods such as frequencies (n), percentages (%), mean (X), and standard deviation (SD) were used for the analysis of descriptive personal information. Prior to the analysis of the research questions, the normality (skewness and kurtosis) test was performed and it was observed that the data that were not in the range of -1 to +1 were not normally distributed [19]. Non-parametric tests, specifically the Mann-

Whitney U test and Kruskal-Wallis H test, were applied to analyze the non-normally distributed data. The participants' scores on the scale were used to calculate the KMO (Kaiser-Meyer-Olkin) and Cronbach's Alpha values. For the pre-test, the KMO value was found to be 0.81, and Cronbach's Alpha was 0.83. For the post-test, the KMO value was 0.86, and Cronbach's Alpha was 0.90.

Results

Table 1 presents the descriptive information of the participants, including the percentage and frequency values. Of the participants involved in the study, 64.2% were male, while 35.8% were female. The distribution of students among departments was as follows: Sports Management (67 students), Teaching (33 students), and Coaching (34 students). Regarding income status, the majority of

participants (74.6%) reported family income falling within the minimum wage to twice that amount. In terms of self-description, based on the responses to the question aimed at assessing the general state of the participants, the majority identified themselves as mild-tempered (34.3%) and happy (38.1%).

Table 2 displays the mean scores of the participants on the pretest and posttest, as well as additional statistical measures. The pretest mean score is observed to be lower than the posttest mean score. The skewness and kurtosis values for both the pretest and posttest indicate a slightly skewed distribution. Additionally, the posttest demonstrates a higher internal consistency compared to the pretest, as indicated by the C'alpha coefficient.

Table 3 presents the results of the statistical analysis comparing the pre-test and post-test mean scores between different groups. The analysis

Table 1. Gender variable percentage and frequency distribution

Author Information		N	%
Gender	Male	86	64.2
	Female	48	35.8
Age	17 - 18 Years	44	32.8
	19 - 20 Years	66	49.3
	21 Years and Above	24	17.9
Department	Sports Management	67	50.0
	Physical Education and Sports Teaching	33	24.6
	Coaching Training	34	25.4
Family Income Status	2020 - 4040 TL	100	74.6
	4041 - 6060 TL	29	21.6
	6061 TL and Above	5	3.7
Mother Education Status	Primary School	67	50.0
	Middle School	35	26.1
	High School	29	21.6
	Degree	3	2.2
Father Education Status	Primary School	52	38.8
	Middle School	33	24.6
	High School	35	26.1
	Degree	14	10.4
How would you describe yourself?	Unhappy	15	11.2
	Irritable	22	16.4
	Mild-mannered	46	34.3
	Happy	51	38.1
	Total	134	100.0

Table 2. Distribution of pre-test – post-test scores

Test	N	X	Ss	Skewness	Kurtosis	C'Alpha
Pre-Test	134	3.96	.50	-1.073	3.348	.83
Port-Test	134	3.69	.62	-1.056	4.029	.90

reveals no significant differences between women and men in both the pre-test and post-test mean scores. Similarly, there are no significant differences observed between females and males in the post-test mean scores. Additionally, no significant differences were found in the mean scores between females and males.

Table 4 presents the comparison of pre-test average scores among sports science students in different age groups. The analysis reveals no significant differences in the pre-test mean scores between the age groups of 17-18 years, 19-20 years, and 21 years and above. Similarly, no significant

differences were found in the post-test mean scores between these age groups.

Table 5 presents the comparison of pre-test mean scores among sports science students, teaching students, and coaching students. The analysis indicates no significant differences in the pre-test mean scores between these groups. Similarly, no significant differences were observed in the post-test mean scores between sports management students, teaching students, and coaching students.

Table 6 presents the comparison of pre-test average scores among sports science students based on different income levels. The analysis reveals

Table 3. Distribution of pre-test and post-test scores by gender variable

Test	Gender	N	Mean Rank	Rank Sum	u	p/ES
Pre-Test Total	Male	86	66.87	5750.50	29.50	.79 / 0.00
	Female	48	68.64	3294.50		
Post-Test Total	Male	86	67.22	5781.00	20.00	.91 / 0.00
	Female	48	68.00	3264.00		

Table 4. Distribution of pre-test-post-test scores by age variable

Test	Age	N	X	Ss	Mean Rank	c2	p/ES
Pre-Test Total	17 - 18 Years	44	4.10	.38	77.10	5.07	0.13 / .05
	19 - 20 Years	66	3.95	.45	65.34		
	21 Years and Above	24	3.75	.71	55.83		
Post-Test Total	17 - 18 Years	44	3.61	.66	60.48	4.04	0.07 / .01
	19 - 20 Years	66	3.70	.59	67.66		
	21 Years and Above	24	3.80	.62	79.94		

Table 5. Distribution of pre-test-post-test scores by department variable

Test	Department	N	X	Ss	Mean Rank	c2	p/ES
Pre-Test Total	Sports Management	67	3.93	.48	62.21	2.13	0.06 / .04
	Physical Education and Sports Teaching	33	3.89	.52	64.26		
	Coaching Training	34	4.15	.48	81.07		
Post-Test Total	Sports Management	67	3.78	.72	71.72	5.64	0.34 / .02
	Physical Education and Sports Teaching	33	3.52	.69	59.95		
	Coaching Training	34	3.69	.00	66.50		

Table 6. Distribution of pre-test and post-test scores by income variable

Test	Income status	N	X	Ss	Mean Rank	c2	p/ES
Pre-Test Total	2020 - 4040 TL	100	3.97	.43	66.95	2.492	.288 / .01
	4041 - 6060 TL	29	3.91	.65	64.83		
	6061 TL and Above	5	4.23	.69	94.00		
Post-Test Total	2020 - 4040 TL	100	3.68	.61	66.00	1.054	.590 / .00
	4041 - 6060 TL	29	3.69	.69	70.10		
	6061 TL and Above	5	3.85	.23	82.40		

no significant differences in the pre-test scores between students with different income levels. Likewise, there were no significant differences found in the post-test average scores among students with varying income levels.

Table 7 presents the comparison of pre-test average scores among sports science students based on their educational backgrounds. The analysis reveals no significant differences in the pre-test scores among primary school students, secondary school students, high school students, and undergraduate students. Similarly, there were no significant differences found in the post-test mean scores among students with different educational backgrounds.

Table 8 presents the analysis of pre-test average scores among sports science students based on their

educational backgrounds. The findings reveal a significant difference in the pre-test scores among primary school students, secondary school students, high school students, and undergraduate students. However, no significant difference was observed in the post-test mean scores among students with different educational backgrounds.

Table 9 presents the analysis of pre-test mean scores among sports science students based on their moods: unhappy, irritable, mild-tempered, and happy. The results indicate that there was no significant difference in the pre-test scores among individuals with different moods. Similarly, no significant difference was observed in the post-test mean scores among students with different moods.

Table 10 presents the analysis of mean scores of pre-test and post-test obtained from sports science

Table 7. Distribution of pre-test-post-test scores according to the variable of mother’s educational status

Test	Mother	N	X	ss	Mean Rank	χ^2	p/ES
Pre-Test Total	Primary school ^a	67	3.95	.41	64.06	9.520	.023* / .18 d;a.b.c
	Middle School ^b	35	4.12	.40	77.07		
	High School ^c	29	3.95	.54	69.91		
	Degree ^d	3	2.64	.97	9.33		
Post-Test Total	Primary school	67	3.81	.60	73.94	4.916	.178 / .00
	Middle School	35	3.57	.62	59.49		
	High School	29	3.61	.64	64.91		
	Degree	3	3.31	.53	42.17		

Table 8. Distribution of pre-test-post-test scores according to the variable of father’s educational status

Test	Father	N	X	Ss	Mean Rank	χ^2	p/ES
Pre-Test Total	Primary school ^a	52	3.93	.43	63.61	12.728	.005* / .12 d;a.b.c
	Middle School ^b	33	3.97	.41	65.56		
	High School ^c	35	4.18	.41	84.64		
	Degree ^d	14	3.54	.73	43.68		
Post-Test Total	Primary school	52	3.71	.59	66.75	.329	.955 / .00
	Middle School	33	3.64	.67	65.35		
	High School	35	3.70	.62	69.11		
	Degree	14	3.73	.66	71.32		

Table 9. How would you describe yourself? Distribution of pre-test and post-test scores by variable

Test	Description	N	X	Ss	Mean Rank	χ^2	p/ES
Pre-Test Total	Unhappy	15	4.05	.47	70.47	1.590	.662 / .02
	Irritable	22	3.79	.66	58.05		
	Mild-mannered	46	4.01	.39	69.62		
	Happy	51	3.97	.51	68.79		
Post-Test Total	Unhappy	15	3.66	.79	70.13	1.178	.758 / .01
	Irritable	22	3.71	.54	74.32		
	Mild-mannered	46	3.72	.56	63.98		
	Happy	51	3.67	.67	66.96		

Table 10. Distribution of pre-test and post-test scores by age variable

Age	N	X	Ss	Mean Rank	χ^2	p/ES
17 - 18 Years ^a	44	4.10	.38	57.25	6.012	0.04* / .05 a-c
19 - 20 Years ^b	66	3.95	.45	69.55		
21 Years and above ^c	24	3.75	.71	80.67		

Table 11. Distribution of pre-test-post-test scores according to department variable

Department	N	X	Ss	Mean Rank	χ^2	p/ES
Sports Management ^a	67	3.91	.48	76.04	6.918	0.03* / .03 a-c
Physical Education and Sports Teaching ^b	33	3.89	.52	61.76		
Coaching Training ^c	34	4.15	.48	56.25		

students based on their age groups. The results indicate that there was no significant difference in the mean scores among participants in different age groups.

Table 11 shows the comparison of pre-test and post-test mean scores obtained from sports science students. The results reveal that there was no significant difference in the mean scores among sports management students, teaching students, and coaching students.

Discussion

There was no significant difference between the variables of gender, age, department, income status of sports science students and the pre-test post-test mean scores of the participants from the “Future Expectation” scale. Yıldırım and Özkan [20] found that there was no significant difference between the variables of gender, age, department and income status of sports science students and the pretest and posttest scores of the participants from the “Future Expectation” scale [20].

In contrast to previous research, the findings of the study conducted by Çapa et al. [21] revealed the presence of gender differences in the future expectations of university students in Turkey. The findings indicated that female students expressed greater concerns about unemployment and anticipated lower income compared to their male counterparts. Similarly, Arslan et al. [22] revealed in their study that gender significantly influenced students’ career goals. Moreover, Capri et al. [23] reported gender disparities in the future expectations of university students in Italy. The study revealed that female students exhibited a stronger inclination towards employment rather than entrepreneurship, unlike their male counterparts.

Based on several studies [24, 25], it has been suggested that age does not play a significant role in shaping students’ future expectations. However, Polat and Şahin [26] conducted a study that presented contrasting results. Their research revealed age differences in the future expectations of

university students in Turkey. Specifically, younger students exhibited higher salary expectations, while older students prioritized job security as a key factor in their future aspirations. These findings highlight the need for further investigation into the complex interplay of age and future expectations among students.

When considering the impact of family income, Park and Lee [27] discovered a positive correlation between the income levels of university students in South Korea and their future expectations. The study revealed that students from higher-income backgrounds had higher salary expectations, while those from lower-income backgrounds prioritized job security.

Similarly, in a study conducted by Çapa et al. [21], examining the maternal education status of university students in Turkey, it was found that there is a positive relationship between the education levels of students’ mothers and their future expectations. The research indicated that students with mothers who had higher education levels had higher salary expectations.

These findings highlight the influence of family income and maternal education status on students’ future expectations, emphasizing the need to consider socio-economic factors when addressing career aspirations and development among university students.

When investigating the influence of father’s education level, Çapri et al. [23] conducted a study revealing a positive correlation between the educational attainment of fathers of university students in Italy and their future expectations. The research demonstrated that students with fathers who had higher education levels held higher salary expectations, while those with fathers who had lower education levels prioritized job security. In line with our research, Tezcan et al. [28] also found that the educational status of parents plays a significant role in shaping students’ future goals. These findings underscore the importance of parental education in influencing students’ expectations and highlight

the need to consider the broader socio-economic context when exploring career aspirations among university students.

The fact that there was no significant difference in the study of sports science students according to their departments can be interpreted as the inability of the participants to shape their future in terms of their departments. Independent of the research. Özkan and Sözbilir [29] revealed in a study they conducted that the expectations of undergraduate and graduate students about the future are different.

In investigating the impact of father's education level, the study conducted by Çapri et al. [23] uncovered a positive correlation between the educational attainment of fathers of university students in Italy and their future expectations. The findings indicated that students with fathers who had higher education levels held higher salary expectations, while those with fathers who had lower education levels prioritized job security. These results align with our own research and are consistent with the findings of Tezcan et al. [28], highlighting the significance of parental educational status in shaping students' future goals. These findings underscore the crucial role of parental influence in students' career aspirations and underscore the need to consider family background when providing guidance and support for students' future prospects.

Conclusions

The research findings indicate that there were no significant differences in the future expectations

of sports science students based on gender, age, department, or income status variables. However, significant differences were observed in relation to the education levels of their mothers and fathers, favoring undergraduate students. Additionally, there was a notable difference in the mean scores between the age groups of 17-18 and those aged 21 and above in both pre- and post-test scores, indicating a potential shift in expectations over time.

Moreover, significant differences were identified between students in the "Sports Management" department and those in the "Coaching" department, with the latter group exhibiting higher future expectations. Overall, the study suggests that students' future expectation levels may decline over the course of four years, irrespective of other variables such as gender, age, department, and income status.

To expand upon these findings and contribute to the existing literature, future research should explore the impact of various other variables that may influence the future expectations of young individuals. This will provide a more comprehensive understanding of the factors influencing their career aspirations and contribute to the advancement of knowledge in the field.

Conflict of interest

The authors declare that there is no conflict of interests.

References

- Llosada Gistau J, Morcillo Hernández V, Troiano Gomà H. L'elecció d'estudis i les expectatives de futur dels estudiants universitaris [The choice of studies and the future expectations of university students]. *Papers. Revista de Sociologia*, 2005;76: 229. (In Spanish). <https://doi.org/10.5565/rev/papers/v76n0.1011>
- Bachan R. Students' expectations of debt in UK higher education. *Studies in Higher Education*, 2014;39(5): 848–873. <https://doi.org/10.1080/03075079.2012.754859>
- Dolu G. University students' opinions concerning science-technology-society issues. *Educational Sciences. Theory & Practice*, 2016; 16: 1051–1076.
- Bandura A. Social Cognitive Theory: An Agentic Perspective. *Annual Review of Psychology*, 2001;52(1): 1–26. <https://doi.org/10.1146/annurev.psych.52.1.1>
- Seginer R. Future orientation in times of threat and challenge: How resilient adolescents construct their future. *International Journal of Behavioral Development*, 2008;32(4): 272–282. <https://doi.org/10.1177/0165025408090970>
- Catalano RF, Berglund ML, Ryan JAM, Lonczak HS, Hawkins JD. Positive Youth Development in the United States: Research Findings on Evaluations of Positive Youth Development Programs. *The ANNALS of the American Academy of Political and Social Science*, 2004;591(1): 98–124. <https://doi.org/10.1177/0002716203260102>
- McCabe K, Barnett D. First Comes Work, Then Comes Marriage: Future Orientation Among African American Young Adolescents*. *Family Relations*, 2000;49(1): 63–70. <https://doi.org/10.1111/j.1741-3729.2000.00063.x>
- Sipsma HL, Ickovics JR, Lin H, Kershaw TS. Future Expectations Among Adolescents: A Latent Class Analysis. *American Journal of Community Psychology*, 2012;50(1–2): 169–181. <https://doi.org/10.1007/s10464-011-9487-1>
- McWhirter EH, Ramos K, Medina C. Y ahora qué? Anticipated immigration status barriers and Latina/o high school students' future expectations. *Cultural Diversity and Ethnic Minority Psychology*, 2013; 19(3): 288–297. <https://doi.org/10.1037/a0031814>
- Ross LT, Hill EM. Childhood unpredictability, schemas for unpredictability, and risk taking. *Social Behavior and Personality: an International Journal*, 2002;30(5): 453–473. <https://doi.org/10.2224/>

- sbp.2002.30.5.453
11. Sharma D, Kaur A. Expectations and challenges of undergraduate students towards higher education and future job prospects. *The International Journal of Indian Psychology*, 2019; 7(3): 263–274.
 12. Toker B, Kalıpçı MB. The Effect of Self-Esteem, Positive Future Expectation and Attitude Toward Future on Happiness: An Analysis of Vocational School Students. *Yuksekogretim Dergisi*, 2021;11(2Pt2): 473–484. <https://doi.org/10.2399/yod.21.578916>
 13. Çelik I, Halmatov M, Halmatov S, Saricam H. Research on views about male university students' marriage and future family role expectation. *Procedia-Social and Behavioral Sciences*, 2012; 46: 3275–3278. <https://doi.org/10.1016/j.sbspro.2012.06.050>
 14. Roslan S, Mustafa M. Determinants of university students' career expectation and the implications for higher education in Malaysia. *Procedia - Social and Behavioral Sciences*, 2016; 222: 580–586.
 15. Orr E, Westman M. Does hardiness moderate stress. and how? In: Rosenbaum M. editors. *Learned resourcefulness. on coping skills. self control and adaptive behavior*. New York: Springer: 1990. P. 64–94.
 16. Aspinwall LG, Taylor SE. Modelling cognitive adaptation: A longitudinal investigation of the impact of individual differences and coping on college adjustment and performance. *Journal of Personality and Social Psychology*, 1992; 63: 989–1003. <https://doi.org/10.1037/0022-3514.63.6.989>
 17. Wyman PA, Cowen EL, Work WC, Raof BA, Gribble PA, Parker GR, Wannan M. Interviews with Children who experienced major life stress: Family and child attributes that predict resilient outcomes. *Journal of the American Academy of Child and Adolescent Psychiatry*, 1992; 31: 904–910. <https://doi.org/10.1097/00004583-199209000-00019>
 18. Tuncer M. Yükseköğretim gençliğinin gelecek beklentileri üzerine bir araştırma [A research on the future expectations of higher education youth] *International Periodical for The Languages. Literature and History of Turkish or Turkic*, 2011; 6(2): 933–946. (In Turkish).
 19. Büyüköztürk Ş. *Deneyisel desenler öntest-sontest kontrol grubu desen ve veri analizi* [Experimental designs pretest-posttest control group design and data analysis] Ankara: Pegem Academy Publishing; 2014. (In Turkish).
 20. Yıldırım A, Özkan M. Spor Bilimleri Öğrencilerinin Gelecek Beklentileri Üzerine Bir Araştırma. [A Study on Future Expectations of Sports Science Students]. *Spor Science Journal*, 2021; 38(2): 45–54. (In Turkish).
 21. Çapa Y, Yıldız N, Atar HY. University students' future expectations: A study on gender differences. *Educational Research and Reviews*, 2016; 11(7): 514–521.
 22. Arslan ME, Arslan ÖE, Özdemir M. Üniversite öğrencilerinin kariyer hedeflerindeki cinsiyet ve gelir durumu farklılıkları [Gender and income differences in career goals of university students]. *Electronic Journal of Social Sciences*, 2017; 16(62): 246–256. (In Turkish).
 23. Çapri S, Mussolino D, Taurino A. Gender differences in university students' expectations about their future careers. *International Journal of Social Economics*, 2018; 45(7): 1041–1054.
 24. Akpınar E, Atan S. Üniversite öğrencilerinin işletme stajlarına yönelik beklentileri [Expectations of university students for business internships]. *Gazi University Journal of the Faculty of Economics and Administrative Sciences*, 2015; 17(2): 25–38. (In Turkish).
 25. Yurdakul B, Şahin M. İlköğretim öğretmenlerinin öğretmenlik mesleğine yönelik algıları ve mesleğe yönelik tutumları [Perceptions and attitudes of primary school teachers towards the teaching profession]. *Education and Science*, 2014; 39(173): 230–243. (In Turkish).
 26. Polat Ş, Şahin İ. Expectations of university students for the future: A study on age differences. *Journal of Business and Economics Research*, 2015; 3(1): 1–10.
 27. Park H, Lee S. The relationship between income level and career expectations of university students in Korea. *International Journal of Educational Development*, 2019; 64: 60–68.
 28. Tezcan G, Arslan C, Kiran-Esen B. Parental involvement. academic self-efficacy and academic achievement: a cross-sectional study on Turkish high school students. *Educational Research and Reviews*, 2015; 10(7): 882–891.
 29. Özkan E, Sözbilir M. The difference between undergraduate and graduate students' career expectations: a study in Turkey. *Studies in Higher Education*, 2019; 44(5): 789–804.
 30. Çakır H. Türk Üniversite öğrencilerinin gelecek beklentileri: Batı ülkeleri ile karşılaştırma [Future expectations of university students: Comparison with Western countries]. *Electronic Turkish Studies*, 2019; 14(11): 379–392. (In Turkish).
 31. Güneri OY, Koçak R, Koçak A. The effect of self-efficacy on career expectations of university students. *Educational Research and Reviews*, 2014; 9(10): 296–302.

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Analysis of the cultivation of social responsibility of physical education students in the context of Healthy China

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Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

Abstract

Background and Study Aim 'Healthy China' is an important symbol of China's social development and national prosperity. As practitioners and disseminators of sports and health, physical education of students should actively play their own specialties in the process of «Healthy China» construction. This study investigates the social responsibility and cultivation of college students so as to create a good atmosphere for educational groups from the four levels of society, family, school, and itself.

Material and Methods The participants were 53 students (aged 19-21 years) from the College of Physical Education and Health of East China Normal University. The «Questionnaire on the Cultivation of Social Responsibility of Students Majoring in Physical Education» was used as a search tool. A total of 60 questionnaires were distributed using the online platform in this study, and 53 valid questionnaires were recovered after sorting and screening. Among them, 32 were male students and 21 were female students.

Results Students lack enthusiasm and initiative in paying attention to national policies, learning health knowledge and technology, and participating in health education. There is also a lack of self-control and perseverance in physical exercise and healthy eating. Insufficient sleep and poor psychological state lead to low participation in social activities; College students have a low awareness of promoting sports spirit.

Conclusions The findings of this study shed light on the crucial need to cultivate social responsibility among college students majoring in sports at multiple levels: society, family, school, and individual. To effectively promote «Healthy China» and maximize the potential impact of physical education students, concerted efforts must be made to address the identified shortcomings and foster a holistic approach to social responsibility.

Keywords: social responsibility, college students, sports major, Healthy China, society, family, school, individual.

Introduction

In October 2016, the Chinese government introduced the "Health China 2030" planning outline, emphasizing health development and promoting health in all policies. This includes strengthening health education, acquiring scientific knowledge, fostering self-disciplined behaviors, and practicing rational nutrition. Additionally, health services optimization, comprehensive fitness campaigns, and improving health literacy are prioritized. Efforts are made to build a healthy environment, conduct patriotic health campaigns, and ensure all-round health maintenance [1]. Subsequently, the government issued successive policy documents to promote health.

Cultivating social responsibility awareness among college students occupies an important position in China's educational development and is a key and important element in the construction of a healthy China. Undergraduates in physical education teacher training colleges have expertise

and skills in physical education and health, so it is necessary to strengthen the cultivation of social responsibility and behavior of physical education students in colleges and universities in the process of building a "Healthy China" [2].

Chinese scholars' literature on "sports" and "social responsibility" primarily focuses on teaching methods. For instance, Chen Yan [3] suggests that cultivating social responsibility in physical education enhances students' social identity and belonging, boosting their confidence. Lin Hao and Jiang Zhiying [4] analyze the connection between physical education and fostering college students' social responsibility, emphasizing its unique role. Other scholars [5, 6, 7, 8] explore the application of the «Teaching for Personal and Social Responsibility» (TPSR) model, offering new teaching methods for cultivating social responsibility. Zhang Min [9] integrates ecological civilization into physical education courses to develop students' social responsibility. Li Baoguo [10] combines ecological civilization and physical education to cultivate social responsibility, proposing optimized physical

education, personalized teaching, situational teaching, and social practice teaching to enhance social identity, sports morality, and adaptability among students [10].

Scholars have primarily focused on innovative physical education methods to cultivate students' social responsibility, lacking specific and relevant strategies for physical education college students. As sports and health practitioners, these students should respond to the country's call and actively contribute to building a healthy China. Therefore, analyzing the current situation and providing targeted suggestions for cultivating social responsibility among physical education college students will aid schools in promoting their development. Examining the current state of cultivating social responsibility and proposing tailored strategies based on survey results can serve as a reference for schools to enhance the cultivation of social responsibility and refine talent development strategies.

Healthy China and the Concept and Current Situation of Social Responsibility of College Students of Physical Education Department

Healthy China

Health is often compared to career, family, reputation, and wealth. To promote a healthy China, we should vigorously promote "patriotic health", "fitness for all", and "health promotion". It is important to encourage the participation of non-governmental organizations in volunteer activities. Additionally, promoting the integration of national fitness and competitive sports and improving their overall level is crucial. We should also encourage universities, local governments, and society as a whole to actively participate.

Abiola Idowu emphasizes promoting Chinese sports spirit, culture, and innovation in national and folk sports [11]. Author suggests integrating sports into school assessment and enhancing sports culture cultivation.

Concept of college students' social responsibility

College students' social responsibility is a multifaceted concept. In Chinese, "responsibility" refers to obligations, including moral, legal, and psychological aspects. Social responsibility extends beyond business and encompasses various aspects. It can be divided into legal and moral responsibility based on social norms. From the perspective of responsibility object, it includes individual and social responsibility. For some, it is a significant aspect of life and the obligation to contribute to society's improvement in a specific historical context.

Social responsibility encompasses the obligations and duties of individuals, groups, countries, and society within a specific timeframe

[12]. It also includes personal obligations such as self-preservation. Wang Siqian [13] concluded that social responsibility refers to a specific period of time. It involves individuals or organizations fulfilling their due responsibility and obligation towards the state, society, family, and other aspects of survival and development (Figure 1). The sense of social responsibility entails individuals' conscious recognition of their responsibilities towards the country, society, family, and school. It involves continuous learning and practice to achieve holistic personal development. Figure 2 provides an overview of the social responsibility theory, which scholars divide into realizing personal value, fulfilling family responsibilities, and contributing to the community and society [14, 15, 16].



Figure 1. Objects of social responsibility

The current situation of social responsibility of college students in physical education.

Physical education resources can be categorized into five areas: human resources, environment, technology, economy, and information. Currently, physical education teaching in Chinese colleges and universities is evolving to align with educational development, students' and teachers' needs for high-quality and diversified physical education. Thus, it is crucial to maximize the utilization of physical education teaching resources in universities [17]. The main problem in physical education at colleges and universities is the presence of both positive and negative factors [18]. Current college students prioritize utilitarian life ideals and lack a strong sense of social obligations. They struggle to distinguish right from wrong and lack practical social skills and a clear understanding of societal roles [18].

Wang Lixin [19] identifies four reasons for the problem of college students' social responsibility: influence of Western values, family education

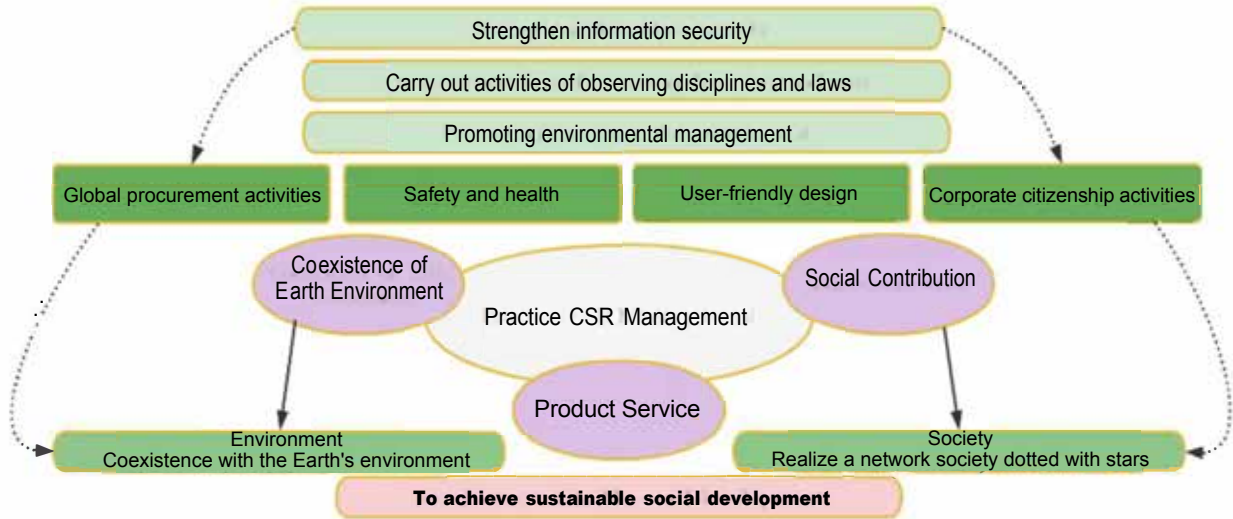


Figure 2. Introduction of social responsibility theory

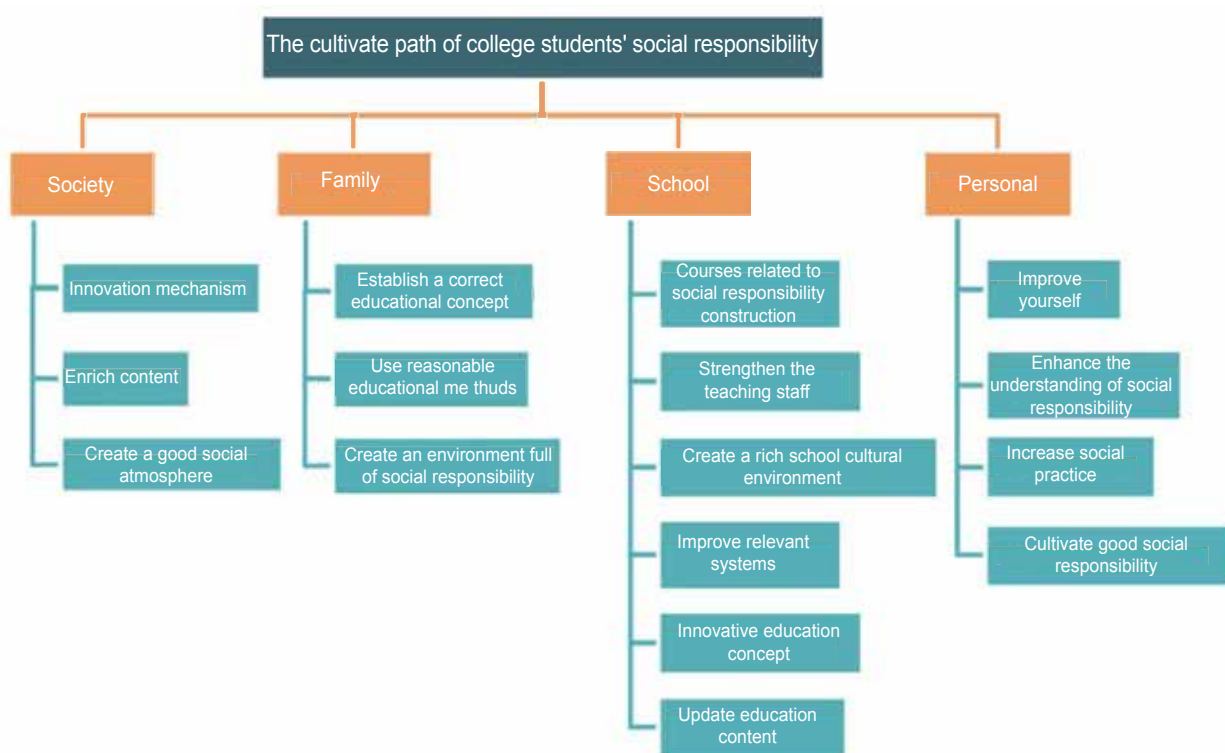


Figure 3. Ways to cultivate college students' social responsibility

defects, school focus on exams, and individual factors. Western values lead to self-centeredness and irresponsibility, while family and school contribute to neglecting social responsibility education. Individual factors include subjective thinking, emotional instability, and poor self-control and practical skills. These factors result in a weak sense of social responsibility among college students [19].

Zhang Dan [20] believes that cultivating a sense of social responsibility among college students requires a multifaceted approach at all levels. He emphasizes the importance of social, family, school, and personal dimensions in fostering social

responsibility (Figure 3). This entails strengthening moral education, enhancing teacher capabilities, and creating a positive campus environment. Furthermore, promoting a healthy lifestyle plays a vital role in improving health literacy among young individuals, reflecting their sense of social responsibility [21]. By emphasizing proper nutrition, responsible medication use, and seeking scientific medical care, we can enhance the overall well-being of the population [22]. Additionally, spreading knowledge about environmental and health protection is crucial for fostering a healthy environment and encouraging responsible

behaviors. Lastly, the promotion of sportsmanship and the cultivation of social responsibility within sports culture are interconnected. College students should actively engage in learning about sportsmanship, its values, and actively promoting sportsmanship through practical actions [23].

By implementing these strategies and approaches, colleges and universities can effectively nurture social responsibility among their students, contributing to a more responsible and engaged society.

Materials and Methods

Participants

Between October 8 and 15, 2022, a group of undergraduate students (aged 19-21 years) from the College of Physical Education and Health at East China Normal University participated in the study. The selection process involved random sampling. A total of 60 questionnaires were distributed online, and after sorting and screening, 53 valid questionnaires were collected. Among the participants, there were 32 male students and 21 female students.

Research Design

Questionnaire

For this study, a survey was conducted using a questionnaire developed by Wang Siqian [13]. The questionnaire used was titled «Questionnaire on the Cultivation of Social Responsibility of Students Majoring in Physical Education.» The primary objective was to assess the extent to which college students majoring in physical education are being cultivated for social responsibility by their teachers. The questionnaire design was based on an understanding of the concept and essence of the sports major. In this context, social responsibility for sports students is defined as assuming responsibilities towards oneself, others, organizations, and societal development. These responsibilities encompass the dissemination of sports knowledge, promotion of healthy lifestyles, fostering a healthy environment, and advancing

sports development within the framework of a healthier China. The questionnaire demonstrated high reliability and validity, with a retest reliability exceeding 0.85, indicating a strong level of reliability and validity for the study.

Interview method

The interviews focused on the concept and content of social responsibility among sports majors and were conducted from September to November 2022. Due to the impact of the pandemic, online interviews were primarily conducted through experts' WeChat and telephone. The interviews involved face-to-face interactions, recorded interviews, and online chats, and were conducted with teachers and students from the College of Physical Education and Health at East China Normal University. Each interview session lasted approximately 15 minutes. The gathered interview data was then summarized and analyzed to identify key themes and specific measures to cultivate social responsibility among physical education students in Shandong sports colleges.

Statistical Analysis

The collected survey questionnaire data was analyzed using software tools such as Excel and SPSS26.0. Descriptive statistics, including frequencies (N), were used to describe the qualitative data. The chi-square (χ^2) test was employed to analyze the data, with statistical significance indicated by a p-value of less than 0.05 ($P < 0.05$).

Results

Disparities in the popularization of sports knowledge (tabl. 1).

Table 1 indicates no significant gender-based difference in physical education knowledge popularity among college students majoring in physical education. The survey findings reveal that teachers actively encourage students to learn physical education and health knowledge, while schools implement measures like skills training courses and referee classes. However, students struggle with popularizing and learning health-

Table 1. Survey statistics of college students of different genders majoring in physical education on popular sports knowledge

Questions	Male (n=32)	Female (n=21)	χ^2	p-Value
Actively learn and master physical education theory and skills in and out of class	25	13	1.644	0.200>0.05
Proactive attention to national policies in the areas of physical education and health	18	10	0.379	0.538>0.05
Learning health knowledge and skills through books, internet and other sources	24	13	1.032	0.310>0.05
Active participation in school health education	26	19	0.842	0.359>0.05

related knowledge, lacking motivation to actively pursue it. Interviews with students highlighted their focus on acquiring professional sports knowledge and skills for future employment prospects, underestimating the importance of broader health information and social issues.

Differences in healthy lifestyle situations (tabl. 2).

Differences in promoting a healthy environmental situation (tabl. 3).

Table 3 reveals no significant gender-based differences in health-promoting environments among physical education college students. The survey highlighted the effective guidance provided by schools and teachers in this aspect. The active

implementation of patriotic health campaigns during the pandemic, along with the promotion of epidemic prevention measures, has created a conducive health environment with the enthusiastic cooperation of students.

Differences in promoting the situation of sports spirit (tabl. 4).

Table 4 indicates no significant gender-based differences in promoting sportsmanship among physical education college students. The survey revealed that only 35.8% of students showed initiative in learning about sportsmanship, while the majority did not take the initiative to learn or promote it.

Table 2. Survey statistics of physical education college students of different genders on healthy lifestyles

Questions	Male (n=32)	Female (n=21)	χ^2	p-Value
Regular physical exercise	15	8	0.398	0.528>0.05
Have good regular eating habits	14	10	0.077	0.782>0.05
Reminder to minimize the time spent staring at the screen of electronic products	11	11	1.693	0.193>0.05
Maintain sufficient sleep time every day, do not stay up late, do regular work and rest	12	6	0.451	0.502>0.05
Teachers encourage students to actively participate in healthy and beneficial cultural, sports and social activities to relieve stress	26	17	0.001	0.978>0.05
Family members have good behavioral habits	14	10	0.077	0.782>0.05

Table 3. Survey statistics of physical education college students of different genders on health-promoting environment

Questions	Male (n=32)	Female (n=21)	χ^2	p-Value
Teachers educate students about environmental and health-related protection and response in the classroom	25	20	2.897	0.089>0.05
Combined with COVID-19 outbreak protection requirements and related work	28	14	3.346	0.067>0.05
Integrating the requirements of the new era of campus patriotic health campaign into the curriculum and teaching materials system	28	16	1.150	0.283>0.05

Table 4. Survey statistics of college students of different genders majoring in physical education in promoting sportsmanship

Questions	Male (n=32)	Female (n=21)	χ^2	p-Value
Conducting lectures on the theme of learning socialist core values	26	17	0.001	0.978>0.05
Organize the viewing of sports videos that reflect the spirit of patriotic dedication, truthfulness and compliance, and unity and hard work	24	15	0.083	0.773>0.05
Take the initiative to learn and promote traditional sports culture through the Internet	12	7	0.096	0.757>0.05

Discussion

Suggestions on the Cultivation of Social Responsibility of Physical Education Students

Strengthen school social responsibility education

The cultivation of social responsibility is a primary focus in physical education colleges, as it shapes students' growth, values, moral qualities, and knowledge and skills in relation to sports, health, social survival, and interpersonal relationships. Strengthening social responsibility awareness, emotional attitudes, and behaviors in colleges and universities is crucial for fostering a culture of social responsibility [24].

The results of this study indicate that schools and teachers play an active role in guiding the popularization of health knowledge and skills, as well as cultivating social responsibility among students in physical education universities. These findings align with the research conducted by Shi Benbiao [25].

To further enhance the sense of social responsibility among sports college students, it is essential to prioritize the cultivation of social responsibility awareness in universities and among physical education teachers. Additionally, improving the social responsibility education system for sports professionals is crucial. This can be achieved by integrating moral education and sports, improving curriculum quality, and promoting the development of social responsibility among sports talents.

In line with the recommendations of Li, Baoguo, and Peng, Zhouen [10], schools should actively engage in practical activities to deepen the sense of social responsibility. Creating a cultural environment that promotes «social responsibility» and actively conducting social responsibility education is highly recommended. Practical initiatives, such as organizing choral competitions and recitation contests during holidays, can effectively deepen college students' sense of social responsibility and foster a strong sense of patriotism [26].

Furthermore, the study highlights the importance of strengthening the physical education teacher team in the new era. This finding aligns with the conclusions drawn by Kenioua [27], which emphasize the high level of social responsibility among physical education teachers. It is crucial to enhance the ethics, morality, and social responsibility awareness of physical education teachers. By doing so, we can effectively cultivate a sense of social responsibility among students pursuing physical education in college.

College students enhance their social responsibility

Signorelli [28] conducted a study highlighting the importance of social responsibility perception and practice for students in teacher training colleges and universities. It is crucial for students

to be aware of and adapt to the complexities of the external environment. Through comprehensive thinking, practical experience, and self-reflection, students can gain a deep understanding of social responsibility and effectively implement it. This process helps them develop outstanding qualities in terms of personality, character, skills, culture, and other aspects. Consequently, they can actively contribute to society's development and create a better future [29].

The findings of this study reveal that college students majoring in physical education exhibit poor eating habits and irregular sleep patterns. To enhance the social responsibility of these students, several factors need to be considered. First, developing self-discipline is essential, involving the ability to identify priorities, eliminate unnecessary tasks, and execute plans effectively. Second, cultivating competence, upholding correct values, formulating sustainable development strategies, maintaining good discipline, being helpful and willing to share, and actively participating in various activities are crucial. Additionally, promoting lifelong sports awareness is important. Lastly, fostering a strong sense of social responsibility is necessary, which includes actively participating in social activities, cooperating in organizing events, and engaging in public outreach. These efforts contribute to a positive psychological state.

By addressing these factors and encouraging students majoring in physical education to adopt responsible behaviors, their overall social responsibility can be enhanced, leading to personal growth and a greater impact on society.

Strengthen family social responsibility education

Previous studies have indicated the significant influence of family factors on college students' awareness, attitude, and behavior regarding social responsibility [13]. As college students, they rely on their families both financially and emotionally, and eventually establish their own families. Thus, improving their sense of responsibility towards their families becomes crucial for family stability, national development, and individual growth [30]. To achieve this, it is necessary to cultivate a strong sense of social responsibility within the family, foster a positive family atmosphere, guide and motivate family members, prioritize health, encourage scientific exercise, and develop good habits [31]. Additionally, this study found that family members' good living habits contribute to the development of social responsibility, aligning with the findings of Wang Siqian [13]. Parents of physical education college students should actively understand the social responsibility associated with their major, communicate and cooperate with them, serve as role models, and provide support to promote the formation and growth of their social responsibility.

Create a good social and educational environment

To strengthen sports-related social responsibility, it is important to establish correct values and beliefs [32]. Role models and ideal beliefs should be cultivated, fostering a sporting culture of patriotism, struggle, tenacity, and solidarity, while providing guidance and motivation to students [32]. This study's results support the idea that creating a nurturing social environment is crucial for cultivating social responsibility in college students [33]. To achieve this, three approaches can be taken: strengthening ideological and political propaganda using the Internet, promoting sports awareness through online platforms and short videos, and creating an atmosphere conducive to sports promotion [33]. Additionally, a positive and healthy sports atmosphere and supportive policy environment are essential for the promotion of sports [34]. For physical education college students, it is crucial to establish an educational environment that clarifies responsibilities, encourages duty fulfillment, and familiarizes them with school regulations through effective communication and propaganda [34]. This will enhance their understanding of their obligations and expand their sense of responsibility.

Conclusions

The cultivation of social responsibility among college physical education students is crucial in the context of «Health China» construction. However, several challenges were identified, including a lack of enthusiasm in following national policies, limited engagement in health education, weak commitment to physical exercise and healthy diet, and insufficient awareness of promoting sports spirit within the college setting.

The study conducted at the School of Physical Education and Health of East China Normal University provided valuable insights into the current situation and cultivation of social responsibility. The research methods employed

facilitated a comprehensive understanding of the students' social responsibility.

To address these challenges and enhance the cultivation of social responsibility, a multi-level approach is recommended. Efforts should be directed towards creating a better social environment at the societal, family, school, and individual levels.

Strengthening the promotion of the family's sense of social responsibility is crucial. Emphasis should be placed on raising awareness and encouraging active participation in health-related activities.

The school's role in cultivating social responsibility should be reinforced through the implementation of effective educational programs and initiatives. These should focus on instilling a strong sense of social responsibility among students and fostering their engagement in health promotion.

College students themselves should be actively involved in the cultivation of their own social responsibility. This can be achieved through self-reflection, self-discipline, and active participation in social activities, promoting a culture of sportsmanship and overall well-being.

In conclusion, by addressing the identified challenges and implementing the suggested strategies, it is possible to cultivate a stronger sense of social responsibility among college physical education students, ultimately contributing to the development of a healthier and more responsible society.

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Conflict of interest

The authors declare that there is no conflict of interest.

References

1. State Council of the Central Committee of the Communist Party of China. *The Central State Council of the Communist Party of China issues the outline of the "Healthy China 2030" plan* [EB/OL]. [Internet]; 2016 [cited 2023 Apr 5]. Available from: http://www.gov.cn/xinwen/2016-10/25/content_5124174.htm
2. Sun QH, Su Y. The practice of cultivating medical students' sense of social responsibility under the background of disaster rescue. *Medical Teacher*, 2020;42(7): 834–834. <https://doi.org/10.1080/0142159X.2020.1755632>
3. Chen Yan. Cultivating students' sense of social responsibility in university physical education. *Industry and Technology Forum*, 2015;14(07):160–161.
4. Lin Hao, Jiang Zhiying. On the cultivation of college students' sense of social responsibility in college physical education. *Bulletin of Sports Science and Technology Literature*, 2014; 22(11): 77–85.
5. Toivonen HM, Wright PM, Hassandra M, Hagger MS, Hankonen N, Hirvensalo M, et al. Training programme for novice physical activity instructors using Teaching Personal and Social Responsibility (TPSR) model: A programme development and protocol. *International Journal of Sport and Exercise Psychology*, 2021;19(2): 159–178. <https://doi.org/10.1080/1612197X.2019.1661268>
6. Zhou Huijian. Research on the application of "teaching personal and social responsibility" model in soccer teaching. *Journal of Nanjing Sports College*, 2015;14(06):121–124. <https://doi.org/10.15877/j.cnki.nsin.2015.06.026>
7. Li Menglu. *Experimental study of TPSR model in the general martial arts curriculum of physical education majors* [Dissertation]. Guangxi Normal University; 2022. (In Chinese). <https://doi.org/10.27036/d.cnki.ggxsu.2022.000538>
8. Deng QL, Jiang F, Tang JY. Research on the construction and practice of teaching mode of college athletics course based on TPSR perspective. *Education Observation*, 2022;11(11):122–124. <https://doi.org/10.16070/j.cnki.cn45-1388/g4s.2022.11.033>
9. Zhang Min. *Research on the cultivation of social responsibility of school physical education courses for students in Kunming universities under the perspective of ecological civilization* [Dissertation]. Yunnan Normal University; 2014. (In Chinese).
10. Li Baoguo, Peng Zhouen. Research on the role of physical education and health courses in cultivating social responsibility among youth in Xinjiang. *Martial Arts Research*, 2020;5(02):118–131. <https://doi.org/10.13293/j.cnki.wskx.008234>
11. Abiola Idowu. Corporate Social Responsibility: Organization's Pull and Push Strategy. *European Journal of Business and Management*, 2019;11 (6): 94–102.
12. Can Zhang. Research on the Cultivation of College Students' Sense of Social Responsibility under the Path of Voluntary Service in Colleges and Universities. *Proceedings of 2nd International Conference on Humanities, Arts, and Social Sciences (HASS 2021)*, 2021;1 (1): 389–391.
13. Wang Siqian. *Research on the Social Responsibility Performance and Cultivation of Physical Education College Students in the Context of Healthy China* [Dissertation]. Shandong Institute of Physical Education; 2021. (In Chinese).
14. Guo Rong. *Exploring the cultivation of social responsibility among college students in the perspective of the new generation of the times* [Dissertation]. East China Normal University; 2022. <https://doi.org/10.27149/d.cnki.gghdsu.2022.003811>
15. Li Nan. *Research on the cultivation of social responsibility among "post-00" college students* [Dissertation]. Xi'an University of Technology; 2021. <https://doi.org/10.27398/d.cnki.gxalu.2021.001064>
16. Wang Huijuan. *Research on cultivation of social responsibility among college students in the new era*. Inner Mongolia University; 2021. <https://doi.org/10.27224/d.cnki.gnmdu.2021.001606>
17. Cohen N, Mizrahi S, Vigoda-Gadot E. Alternative provision of public health care: the role of citizens' satisfaction with public services and the social responsibility of government. *Health Economics, Policy and Law*, 2022;17(2): 121–140. <https://doi.org/10.1017/S1744133120000201>
18. José Poças Rascão. Freedom of Expression, Privacy, and Ethical and Social Responsibility in Democracy in the Digital Age. *International Journal of Business Strategy and Automation*, 2020;1(3):1–23. <https://doi.org/10.4018/IJBSA.2020070101>
19. Wang Lixin. Research on the problems and countermeasures of social responsibility of college students in the new era. *Journal of Jiamusi Vocational College*, 2021;37(01):57–59.
20. Zhang Dan. Analysis of the cultivation path of social responsibility of college students in the new era. *New West*, 2020;502(03):130–133.
21. Tahniyath Fatima. Impact of Employees' Perceived Corporate Social Responsibility on Organizational Citizenship Behavior: A Proposed Theoretical Model. *International Journal of Customer Relationship Marketing and Management*, 2020;11(3): 25–38. <https://doi.org/10.4018/IJCRMM.2020070102>
22. *Notice of the State Council on Printing and Distributing the 13th Five Year Plan for Health and Safety (Guo Fa [2016] No. 77)* [EB/OL]. [Internet]; 2017 [cited 2023 Apr 5]. Available from: http://www.gov.cn/zhengce/content/2017-01/10/content_5158488.htm
23. Ayat Karaja, Emad Al Shikh, Israa Mansour. Impact of applying social responsibility accounting on companies' financial performance. *European Journal of Business and Management*, 2019;11(15): 144–154. <https://doi.org/10.7176/EJBM/11-15-17>
24. Huéscar Hernández E, Moreno-Murcia JA, Espín J. Teachers' interpersonal styles and fear of failure from the perspective of physical education students. Manalo E (ed.) *PLOS ONE*, 2020;15(6): e0235011. <https://doi.org/10.1371/journal.pone.0235011>
25. Shi Benbiao. *Research on the cultivation of social*

- responsibility among contemporary college students. [Dissertation]. Guizhou University of Finance and Economics; 2022. (In Chinese). <https://doi.org/10.27731/d.cnki.ggzcj.2022.000225>
26. Hartley J, Ellis K, Leaver T. Open Literacy: Games, Social Responsibility and Social Innovation: Editorial Introduction to the Special Issue of *Cultural Science Journal*. *Cultural Science Journal*, 2021;11(1): 134–142. <https://doi.org/10.5334/csci.132>
27. Kenioua M. The citizenship and its relationship with the social responsibility among physical education teachers. *Pedagogy of Physical Culture and Sports*, 2020;24(2): 59–63. <https://doi.org/10.15561/26649837.2020.0202>
28. Signorelli C, Odone A, Ricciardi W, Lorenzin B. The social responsibility of public health: Italy's lesson on vaccine hesitancy. *European Journal of Public Health*, 2019;29(6): 1003–1004. <https://doi.org/10.1093/eurpub/ckz135>
29. Zhang R. The Application and Development of Humanities in Physical Education. *Science Innovation*, 2020;8(3): 65. <https://doi.org/10.11648/j.si.20200803.13>
30. Wagner FW. Unternehmensbesteuerung und Corporate Social Responsibility [Corporate Taxation and Corporate Social Responsibility]. *Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung*, 2019;71(3–4): 347–380. (In German). <https://doi.org/10.1007/s41471-019-00075-z>
31. JianLin Wei. The Combination Strategy of Students' Professional Ability and Sports Accomplishment in Higher Vocational Physical Education. *Frontiers in Sport Research*, 2019; 1(4): 80–84. <https://doi.org/10.25236/FSR.2019.010415>
32. Cardinal BJ, Szarabajko A. What role does physical education play in squelching adults' active, healthy living?: Editor: Kirk E. Mathias. *Journal of Physical Education, Recreation & Dance*, 2019;90(3): 56–57. <https://doi.org/10.1080/07303084.2018.1559663>
33. Wu Shuaishuai. *Research on the cultivation of social responsibility of college students based on information society* [Dissertation]. Nanjing University of Posts and Telecommunications; 2015.
34. Li Honghai. Research on Physical Education and Cultivation of students' core literacy. *Frontiers in Sport Research*, 2020;2(2):4–6. (In Chinese). <https://doi.org/10.25236/FSR.2020.020202>

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