The journal represents original scientific researches of scientists from the East-European region.
The Journal welcomes articles on different aspects of physical education, sports and health of students which cover scientific researches in the related fields, such as biomechanics, kinesiology, medicine, psychology, sociology, technologies of sports equipment, research in training, selection, physical efficiency, as well as health preservation and other interdisciplinary perspectives.

In general, the editors express hope that the journal "Physical Education of Students" contributes to information exchange to combine efforts of the researchers from the East-European region to solve common problems in health promotion of students, development of physical culture and sports in higher educational institutions.

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ORIGINAL ARTICLE

The mediating role of psychological resilience in the relationship between epidemic anxiety and academic motivation of physical education teacher candidates

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Abstract

Background and Study Aim	In addition to their physiological effects, epidemics negatively affect the motivation of individuals by causing varying levels of psychosocial problems such as stress, fear, anxiety and depression. At this point, psychological resilience is considered as an important variable in reducing and preventing the psychological effects of epidemic anxiety. The main purpose of this study is to examine the mediating role of psychological resilience in the relationship between epidemic anxiety of physical education teacher candidates and their academic motivation.
Material and Methods	The study group of the research, which was designed in the relational screening model, consists of 451 physical education teacher candidates. They are studying in the 4th grade of the Physical Education and Sports Teaching program of the universities. The data of the research was collected with "Personal Information Form", "Epidemic Anxiety Scale", "Academic Motivation Scale" and "Brief Psychological Resilience Scale". Descriptive statistics techniques, correlation and regression analyzes were used to analyze the data. The PROCESS macro extension was used for mediation analysis.
Results	The mean score levels of physical education teacher candidates were 57.03±14.52 for epidemic anxiety, 92.74±15.72 for academic motivation, and 20.26±5.00 for psychological resilience. While epidemic anxiety predicted psychological resilience (95%CI [-0.168; -0.109], p<.001) negatively, psychological resilience predicted academic motivation positively in a significant way (95%CI [0.727; 1.331], p<0.01). When psychological resilience was included in the model, the overall effect of epidemic anxiety on academic motivation (95%CI [-0.083; 0.123], p>0.05) became insignificant. Psychological resilience has a mediating role in the relationship between epidemic anxiety and academic motivation.
Conclusions	Psychological resilience emerged as an essential variable in preventing the psychological effects of physical education teacher candidates regarding epidemic anxiety and increasing their academic motivation.
Keywords:	psychological resilience, motivation, epidemic anxiety, physical education, teacher candidate.

Introduction

Epidemics that occurred during the historical process always negatively affected societies materially and morally. Lately, the Coronavirus (COVID-19) pandemic, which emerged in Wuhan, China in December-2019, caused a global-scale pandemic [1]. In addition to the physiological effects, pandemics creates psychosocial problems in individuals at varying levels, especially stress, fear, anxiety and depression [2, 3, 4]. Moreover, these psychosocial problems negatively affect the motivations of individuals, which form the basis of many behaviors in their lives. Because motivation is a complex and multidimensional psychological factor which includes needs, beliefs, goals, emotions and values [5, 6, 7]. Motivation in education is a driving force that initiates, directs, maintains and

terminates action towards the goals of individuals [8, 9] and is addressed as academic motivation [10, 11, 12]. Among the various theories developed about academic motivation, the most researched subject is the "Self-Determination Theory" developed by Deci and Ryan and it has three dimensions as Internal, External and amotivation, and the basic distinction is being made between Internal and External motivation. In theory, it is stated that three psychological needs are necessary, namely "competence", "relatedness" and "autonomy" and that motivation will increase if these psychological needs are satisfied [9, 13].

The negative emotional states that individuals have experienced together with epidemic anxiety adversely affect their academic motivations, which undoubtedly includes a psychological process. At this point, another psychological feature that is closely related to both epidemic anxiety and

academic motivation is "psychological resilience". These characteristics, which help individuals to cope with the negative situations, have experienced more effectively and to be stronger in the face of these negative psychological factors, are defined as psychological resilience [14]. Originally derived from Latin roots "resiliens", resilience is described as the ability to achieve positive and unexpected outcomes under difficult conditions and adapt well to extraordinary circumstances and situations [15, 16]. Because individuals who are psychologically resilient have the necessary skills and competencies that help them overcome adversities of life [17]. In summary, resilience refers to all of the psychological and behavioral abilities that enable individuals to stay calm in extraordinary situations such as crisis and chaos and to prevent negative consequences that they may face in the long run [18].

Studies have shown that individuals with a high level of resilience are more empathetic and has internal control, they are not intimidated in the face of stressful events on the contrary, they stand more strongly [19, 20, 21]. Studies also shows that psychological resilience can serve as a protective factor against psychiatric disorders caused by challenging adversities such as anxiety, depression and stress [22, 23, 24]. As such, resilience emerges as a fundamental variable in reducing and preventing the negative psychological effects of epidemic anxiety. From this point of view, the main aim of this study is to examine the mediating role of psychological resilience in the relationship between the epidemic anxiety and academic motivation of physical education.

Materials and Methods

Participants

The study group of the research consists of 451 volunteer physical education teacher candidates studying in the 4th grade of the Physical Education and Sports Teaching program of the universities in 2021-2022 spring term. The data of the research were collected online using GoogleDocs infrastructure. 206 (45.7%) of the physical teacher candidates participating in the research were male, 245 (54.3%) were female, with a mean age of 22.57±3.77.

Ethical Approval

The necessary permission for the research was obtained from the Scientific Research and Publication Ethics Committee of Mardin Artuklu University with the decision dated 16.03.2022 and numbered 2022/3-18.

Research Design

In this research, where the mediating role of psychological resilience in the relationship between epidemic anxiety states and academic motivations of physical education teacher candidates was examined, relational screening model was utilized. In the study, firstly, the relationship between epidemic anxiety and academic motivation was tried to be determined, and then it was investigated whether psychological resilience had a mediating effect on the relationship between these two variables. The model of the study is shown in Figure 1.

The data of the study were collected with the "Personal Information Form" with two questions (gender and age) created by the researcher, "Epidemic Anxiety Scale", "Academic Motivation Scale" and "Brief Psychological Resilience Scale". Information on the scales is given below.

Epidemic Anxiety Scale (EAS): The scale developed by Sayar et al [25] to measure epidemic disease anxiety consists of 4 sub-dimensions as "Epidemic, Economic, Quarantine and Social Life" and a total of 18 items. The items of the scale were rated as "1: Not suitable for me at all", "2: Less suitable for me", "3: Moderately suitable for me", "4: Very suitable for me" and "5: Completely suitable for me" and were rated in five-point Likert type. The highest score that can be obtained from the entire scale is 90, and the lowest score is 18. The total score obtained from the scale was defined as "no anxiety" in the range of 18-32, "less anxious" in the range of 33-46, "moderately anxious" in the range of 47-61, "highly anxious" in the range of 62-75 and "very high anxious" in the range of 76-90. While the four-factor structure of the scale explained 65% of the total variance, the test-retest reliability coefficient
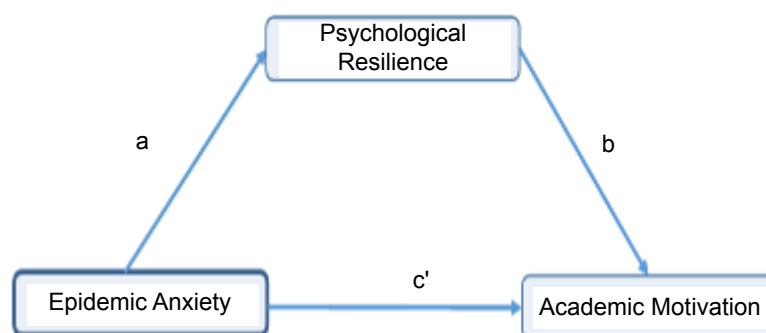

Figure 1. Study Model

was found to be .73, the Cronbach's alpha internal consistency coefficients of the sub-dimensions were between .77 and .89, and the total of the scale was .90. In the current study, the Cronbach's alpha internal consistency coefficients of the four-factor structure of the scale were calculated as between .82 and .86, and .89 for the total of the scale.

Academic Motivation Scale (AMS): The scale, which was developed by Vallerand et al [26] in Canada and adapted to Turkish by Karagüven [27] consists of seven different dimensions and 28 items in total, each of which consists of three "Internal Motivation", three "External Motivation" and one "Amotivation" dimension. The sub-dimensions are respectively; "Internal Motivation-Knowing (IMBI), Internal Motivation-Achievement (IMBA), Internal Motivation-Movement (IMH)", "External Motivation-Recognition (DMT), External Motivation-Self-Proof (DMKI), External Motivation-Regulation (DMD) and Amotivation (MS)" dimensions. The items of the scale were rated in a seven-point Likert type as (1-Strongly Disagree, 7-Strongly Agree). The scores obtained from the "Internal" and "External" motivation sub-dimensions of the scale range from 12 to 84, and the scores from the "Amotivation" sub-dimension range from 4 to 28. High scores from the sub-dimensions indicate that that dimension of motivation is high. As a result of the confirmatory factor analysis (CFA) applied on the seven-dimensional structure of the scale, the values related to the model-data fit (Goodness of Fit Index) were found as $\chi^2/sd=3.09$, GFI=.94, AGFI=81, RMR=.06 and RMSEA=.07 within acceptable lower limits. In the original study of the AMS (Vallerand et al., 1992), the Cronbach alpha internal consistency coefficients of the sub-dimensions were found between .83 and .86, and in the Turkish adaptation it was found between .67 and .87. In the current study, the Cronbach's alpha internal consistency coefficients of the scale were calculated as between .81 and .89, and .86 for the total of the scale.

Brief Psychological Resilience Scale (BPRS): Developed by Smith et al. [28] in order to measure the psychological resilience levels of individuals, on the other hand, adapted into Turkish by Doğan [29] in a sample of university students in Turkey, after examining its validity and reliability, BPRS is a self-reported, 5-point Likert type (1: Not Suitable at all -5: Completely Suitable) one-dimensional scale and consists of 6 items in total. High scores obtained after negative items in the scale were coded in reverse indicate a high level of psychological resilience. As a result of exploratory factor analysis (EFA), the single-factor structure of the scale explains 54% of the total variance, and the goodness of fit values obtained as a result of CFA were found within acceptable limits as such $\chi^2/sd=1.83$, GFI=.99, AGFI=.96, RMR=.03 and RMSEA=.05. While the Cronbach's alpha internal consistency coefficient of the scale was found to be .83, in the current study, the single-factor 6-item internal consistency coefficient of the scale was calculated as .75.

Statistical Analyses

The analysis of the data obtained from the research was carried out with the "IBM SPSS Statistics 22" package program. In the analysis, firstly, the skewness and kurtosis coefficients were examined in order to determine the conformity of the data to the normal distribution. Pearson Product Moments Correlation and regression analysis were used to determine the relationships and effects between variables. In the regression analysis, it was seen that there was no multicollinearity problem (VIF<10) among the independent variables and there was no autocorrelation (DW=2.005) between the error terms of the dependent variables. For mediation analysis, model 4 was utilized in the PROCESS macro extension based on Hayes' [30] Bootstrapping (5000 samples) approach.

Results

The descriptive statistics of the scores obtained from the epidemic anxiety, academic motivation and psychological resilience scales within the scope of the research and the results of the correlation analysis of the relations between the variables are presented in Table 1.

According to Table 1, the mean values of physical education teacher candidates' epidemic anxiety levels was 57.03±14.52, the mean of academic motivation levels was 92.74±15.72, and the mean of psychological resilience was 20.26±5.00. Considering the lowest and highest score ranges that can be obtained from the scales; it can be said that the epidemic disease anxiety and academic motivation of the physical education teacher candidates were at a moderate level, and their psychological resilience

Table 1. Descriptive statistics and correlation analysis results

Variables	Mean	SD	Skewness	Kurtosis	1	2	3
1. Epidemic Anxiety	57.03	14.52	0.495	0.364	1		
2. Academic Motivation	92.74	15.72	0.122	-0.350	-0.114*	1	
3. Psychological Resilience	20.26	5.00	0.127	-0.434	-0.404**	0.320**	1

**Correlation is significant at the 0.01 level (2-tailed).; *Correlation is significant at the 0.05 level (2-tailed).

levels were above the average. It was observed that the Skewness values of the scores obtained from the scales varied between 0.122 and 0.495, and the Kurtosis values between -.0.434 and 0.364. Since the values are between ±1.5 limits, it is accepted that the data show a normal distribution [31].

Again, when Table 1 is examined, there is a weak negative and significant correlations between epidemic anxiety and academic motivation (r= -0.114; p<0.05), moderate negative correlations between epidemic anxiety and resilience (r= -0.404; p<0.01), and moderate positive correlations between academic motivation and resilience (r= 0.320; p<0.01). The results of the analysis carried out through the regression-based PROCESS application in order to test whether the psychological resilience of the physical education teacher candidates have a mediating role in the relationship between their anxiety about the epidemic and their academic motivations are presented in Table 2 and Figure 2.

When Figure 2 is examined, while epidemic anxiety predicted psychological resilience (B=-0.404, 95%CI [-0.168; -0.109], p<.01) negatively, psychological resilience predicted academic motivation positively (B=0.328, 95%CI [0.727; 1.331], p<.01). When psychological resilience is included in the model; it is observed that the overall effect of epidemic anxiety on academic motivation (B=-0.124, 95%CI [-0.223; -0.024], p<.01) decreased and became meaningless (B=0.019, 95%CI [-0.083; 0.123], p> .05). According to this result, psychological resilience played a full

mediating role in the relationship between epidemic anxiety and academic motivation. In addition, when the regression analysis results of the mediation model (Table 2) are examined; epidemic anxiety accounts for 16.3% (R^2=0.163, F=87.450, p<.01) of the change in the resilience of physical education teacher candidates, and resilience accounts for 32.1% (R^2=0.321, F=25.699, p<.01) of the change in academic motivation. The indirect effect of epidemic anxiety on academic motivation through resilience (Effect=-.0.143, 95%CI [-0.222, -0.083]) is significant since the Bootstrapping confidence interval does not contain zero (0) [30].

Discussion

As a result of this research where the mediating role of psychological resilience in the relationship between the epidemic anxiety and academic motivation of physical education teacher candidates was investigated. It was determined that epidemic anxiety had a negative and significant effect on psychological resilience, while psychological resilience has a positive and significant effect on academic motivation. In the study, it was also found that the negative effect of epidemic anxiety on academic motivation was found to be insignificant when psychological resilience was included in the model. According to this result, the effect of epidemic anxiety on academic motivation is based on psychological resilience, and it was observed that resilience played a full mediating role at this

Table 2. Regression Analysis Results Regarding the Mediation Model

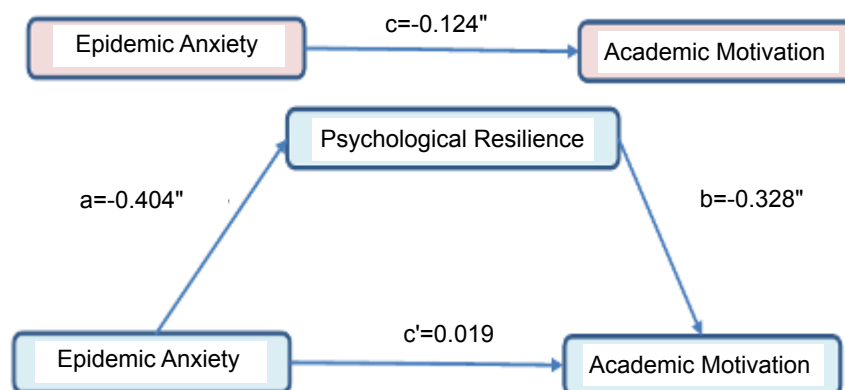| Variables		Psychological Resilience (M)				Academic Motivation (Y)		
		B	SE	p		B	SE	p
Epidemic Anxiety (X)	a	-0.404	0.015	<.01	c'	0.019	0.053	.715
Psychological Resilience (M)		-	-	-	b	0.328	0.154	<.01
Constant	İM	28.204	0.876	<.01	İy	70.785	5.188	<.01
		R2=0.163; F=87.450. p<.01				R2=0.321; F=25.699, p<.01		
Indirect Effect = -0.143; BootSE: 0.035; Bootstrapping 95% CI [-0.222; -0.083]								

Figure 2. Diagram of the Mediation Model

point. It was seen that the academic motivations of physical education teacher candidates were partially affected by epidemic anxiety and more by their psychological resilience. In fact, these three concepts are psychometrically related to each other, but psychological resilience played a more dominant role in this relationship.

In the study, it was seen that the finding that epidemic anxiety negatively affected the psychological resilience of physical education teacher candidates was similar to the results of the research conducted in the field. In various publications investigating the psychological effects of epidemics on societies determined that psychological symptoms such as fear, anxiety and hopelessness were encountered more frequently, and that most of the individuals experienced the fear of contracting the disease, distress and grief together [32, 33]. Especially with the COVID-19 pandemic experienced all over the world, for children and adolescents to experience anxiety, panic and fear for themselves, their families, friends, loved ones and relatives was seen as a normal situation, and the level of anxiety and fear of individuals were increased [3,34,35]. As a matter of fact, studies show that the pandemic had negative psychological effects on many people, especially students, on a global scale and in varying sizes, like other previous epidemics [36, 37] and the psychological resilience levels of individuals decreased [38, 39, 40].

Data from the UK Office for National Statistics show that around 72% of people in the UK are concerned about the impact of COVID-19 on their lives, and many of them reported high levels of anxiety (32%) [41]. Ran et al. [42] in their research found that psychological resilience was negatively associated with symptoms of depression, anxiety, and somatization, and participants with higher psychological resilience were less likely to exhibit emotional problems. Davydov et al. [43] state that undesirable behaviors such as difficulty in solving problems or stress are associated with low psychological resilience. Öztürk [44], in thesis study in which he examined the relationship of fear of Covid-19 with anxiety and psychological resilience in adults, found that the fear of Covid-19 was significantly related to both the level of anxiety and the level of psychological resilience. Another result obtained from the study is that epidemic anxiety negatively affects the academic motivation of physical education teacher candidates. When

the literature is examined, similar results are observed. Araki [45] found that students' academic performance was negatively affected by the feeling of helplessness along with anxiety. Marler et al. [46] found that the psychological distress caused by the COVID-19 epidemic negatively affected the academic motivation of students with high academic performance.

The last result achieved from the study is that physical education teacher candidates' psychological resilience shows a full mediating role in the relationship between their anxiety about the epidemic and their academic motivation. Psychological resilience, a concept that is overemphasized, has started to be examined in connection with many risk factors and negative life events in childhood and adolescence [47]. Psychological resilience emerges as an important factor which successfully protects individuals from various risks in life [48]. While the adversities that individuals face in different periods of their education life cause academic exhaustion, their psychological resilience acts as an important barrier at this point [49, 50]. Studies have found positive relationships between focusing on academic goals, especially internal motivation and academic performance, and psychological resilience, and negative relationships between anxiety and stress [51, 52, 53], with the increase in psychological resilience the fear of Covid-19 decreases [54, 55, 56]. Resilience is a protective factor for anxiety and depression [57, 58, 59] and as students' levels of psychological resilience, positivity and hope increase, they will experience less emotional burnout, become less insensitive to their environment and feel less personal inadequacy [60].

Conclusions

As in the current studies, in this study psychological resilience emerged as a basic variable to prevent the psychological effects of epidemic anxiety and to increase academic motivation. In order to obtain more in-depth findings, extensive qualitative research may be conducted in this area. Besides, it would be beneficial to conduct new research using different models with psychosomatic data obtained from clinical trials.

Conflict of interest

The authors declare no conflict of interest.

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ORIGINAL ARTICLE

Investigation of the relationship between exercise addiction and personality traits of university students

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Abstract

Background and Study Aim	It is a fact that in recent years people's interest in being healthy and physical appearance has increased. Therefore, it can be said that the number of people exercising is increasing day by day. It is seen that some of these people who exercise are now at the level of addiction. This study was conducted to determine the effect and relationship of personality traits on exercise addiction.
Material and Methods	The sample of the study consists of 535 people, 160 females and 375 males, who are studying at Bandırma Onyedi Eylül University and selected by simple random sampling method. In order to collect data in the study a personal information form including the demographic characteristics of the participants was requested. The Exercise Addiction Scale for Youth was administered. The Five Factor Personality Scale, which consists of openness to experience, conscientiousness (self-control), extraversion, agreeableness and emotional instability (neuroticism) sub-dimensions, was used. T-test was used for pairwise comparisons and ANOVA test was used for multiple comparisons. Correlation analysis was used to determine the relationship between personality and exercise addiction and regression analysis was used to determine the effect of personality on exercise addiction.
Results	In the study, it was determined that there was a significant difference in terms of exercise addiction in the variables of gender, age, having an athlete license and years of doing sports. In addition, it was seen that there was a significant difference in terms of personality sub-dimensions in the variables of gender, having an athlete license and years of doing sports. While it was seen that there was a significant positive correlation between the participants' personality scale average and exercise addiction. It was determined that personality explained 18% of exercise addiction.
Conclusions	As a result of the study, it was observed that: being male and being a licensed athlete increased the level of exercise addiction; the exercise habit turned into addiction with increasing age. Personality traits were found to have a positive relationship and significant effect on exercise addiction.
Keywords:	exercise addiction, personality, student

Introduction

Exercise is defined as planned, programmed, regular and repetitive activities performed in order to maintain or improve one or more components of physical fitness [1]. In contemporary societies, many people have made exercise an important component of their daily lives and therefore the number of people who take regular exercise seriously for a healthy life has increased day by day [2]. Although exercise is generally seen as a positive behaviour due to its physical, physiological and psychological benefits [3, 4], it has recently been observed that excessive physical activities can also cause negative effects such as exercise addiction [5, 6, 7, 8]. Exercise addiction, which is described as the "dark side" of exercise and a disease that negatively affects human health, has recently been addressed by many researchers [9, 10, 11, 12].

Exercise addiction is defined as exercise going beyond the control of the person, continuously increasing the duration, frequency and intensity of exercise in order to achieve the desired effect at the end of exercise, not being able to spare time for friends and family because of the inability to give up exercise, preferring to exercise instead of participating in social activities and reorganising one's life within the framework of exercise habits [13]. According to Hausenblas and Downs, it is the state of uncontrolled excessive exercise and excessive willingness to spend time with physical activity despite the presence of obstacles [14]. According to De-Coverly Veale, there is a possibility that exercise can become an addiction along with behaviours such as gambling, eating, computer games, sexual activity and internet use [15]. People who are addicted to exercise have symptoms such as need to exercise more and more every day, not being able to stop exercising, experiencing anxiety or tension when exercise is interrupted, spending too much time exercising, exercising for more time than expected, and preferring exercise instead of socialising with the environment [4]. If there is a constant feeling of deficiency in the exercise performed and this desire increases, this situation

is turned into a problem by the person [16]. The physical and mental attachment to exercise is the reason why exercise cannot be stopped [17]. In this case, negative conditions such as tension, insomnia, irritability, restlessness, insensitivity, laziness and headache may occur in the individual [18].

Based on the results of research on exercise addiction in the literature, the prevalence in the general population is estimated to be close to 3% [19]. In many studies, it has been shown that the incidence of exercise addiction is higher in individuals who do regular sports [20, 21]. It has been found that the risk of exercise addiction is more pronounced among certain groups, mostly runners [22]. In other studies, it has been determined that excessive exercise for the purpose of keeping weight in balance, looking good and increasing body motivation is addictive [23, 24, 25, 26]. However, there are no clear results on this subject and the factors that cause addiction have not been clearly stated. Therefore, more research is needed in different groups and populations to determine these factors and to prevent and treat addiction [27]. On the other hand, as revealed in the researches, determining the addiction levels of individuals who exercise is very vital in terms of individual, family and public health. As time passes, individuals who exercise attach more importance to participating in exercise than their family and social relationships, and in the future, the current situation may get out of the person's control. Exercise addiction, which is considered as both a psychological and physiological problem, and to be able to determine the factors affecting this addiction and to apply the methods used to control exercise addiction individually are important for healthy living habits. For this reason, it is important to identify such a situation before it affects the person's life and to take the necessary measures.

In a systematic study conducted by Hausenblas and Downs, it was stated that exercise addiction is related to personality traits as well as many factors such as psychological and physiological factors, type of exercise, gender, exercise age [14]. The most basic structure that determines the relationship patterns of an individual is personality [28]. Cüceloğlu defines personality as a unique, structured, consistent form of relationship formed by the inner and outer world of the individual [29]. In the definitions made by scientists, it would be a common point to call personality the characteristics that distinguish individuals from each other and make them different [30].

Although the relationships of exercise addiction with many different parameters such as age, sport age, gender have been examined in the literature recently, no study has been found to question the relationship with personality traits. Today, one of the points of interest is whether personality traits

are effective on some behaviours. Indeed, according to Mount, an individual's behaviours are influenced by his/her personality [30]. Digman and Takemoto-Chock suggested that personality is an important determinant of human behaviour [31]. Based on all this information, the aim of this study is to determine whether there is a relationship between exercise addiction and personality traits of university students and to analyse exercise addiction in terms of different variables.

Materials and Methods

Participants

A total of 535 students (160 female, 375 male) who were active students at Bandirma Onyedi Eylul University in the 2022-2023 academic year and who were not studying in the preparatory class voluntarily participated in the study. Demographics of participants appear in Table 1.

Table 1. Demographic information on participants

Variables	Groups	F	%
Gender	Female	160	29.9
	Male	375	70.1
Age	17-18 years	103	19.3
	19-20 years	238	44.5
	Age 21 and over	194	36.3
Training Age	1-5 years	252	47.1
	6 and more years	283	52.9
Licence	Yes	268	50.1
	No	267	49.9
Total		535	100

Research Design

Relational screening method was used as the method in the study. In this study, descriptive analysis and correlational research model were used in accordance with the objectives. The correlational research model specifies the current problem, the situations encountered with this problem, and the relationships between variables and variables [32]. Descriptive model is a research approach that aims to describe a past or current situation as it exists. The person or object that is the subject of the research is tried to be defined in its own conditions and as it is. The researched object is not tried to be affected, changed or transformed in any way. Whatever is desired to be known is tried to be taken [33].

Data Collection Tools. The data in this study were collected using a questionnaire form prepared by the researcher asking demographic data, "The Exercise Addiction Scale for Young People" and "The Five Factor Personality Scale".

Personal Information Form: A form created by the

owner of the study and including the questions of age, gender, being a licensed athlete or not, training age.

Exercise Addiction Scale for Young People: In the study, the "Youth Exercise Addiction Scale" developed by Lichtenstein et al. and adapted into Turkish by Dokuzoğlu et al. and validity and reliability study were used [34, 35]. It has a 5-item unidimensional structure. The scale has a 5-point Likert-type rating ranging from Strongly Disagree (1) to Strongly Agree (5). The scale score range is minimum 5 and maximum 25. Cronbach's alpha (α) value of the scale was found to be 0.71.

Five Factor Personality Scale: In the study, the "Five Factor Personality Scale" developed by Rammstedt and John and adapted to Turkish culture by Horzum, Ayas and Padır, validity and reliability study was used [36, 37]. This scale measures five important personality traits: "openness to experience (1-6)", "conscientiousness (self-control) (2-7)", "extraversion (3-8)", "agreeableness (4-9)" and "emotional instability (neuroticism) (5-10)".

Collection of Data. The data collection tools used in the research were applied online through Google Forms to the athletes who created the sample. Data collection tools have been sent to athletes via email. The preliminary section of the form included information 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

SPSS 25 package programme was used for data analysis. Whether the data showed normal distribution was determined according to kurtosis and skewness values. In the study, t test was used for the paired comparisons (being a licensed athlete, gender, training age) and ANOVA test was used for the multiple comparisons (age). In addition, Pearson correlation analysis was used to determine the relationship between students' exercise addiction and personality, and linear regression analysis was used to determine the effect of personality on exercise addiction.

Results

Table 2 shows the t-test results based on the gender variable of the students. Accordingly, while a significant difference was found in the Conscientiousness (self-control) sub-dimension (p<0.05), no significant difference was found in the other sub-dimensions and personality averages (p>0.05). According to this, women have higher levels of Conscientiousness (self-control) than men. There is a statistically significant difference in terms of exercise addiction (p<0.05). Men were found to have higher levels of exercise addiction than women.

Table 3 shows the t-test results based on the training age variable of the students. According to this, while a statistically significant difference was found in the agreeableness sub-dimension depending on the training age variable of the students (p<0.05), no significant difference was found in the personality scale average and other sub-dimensions (p>0.05). Students who have been doing

Table 2. T-test results of students' exercise addiction and personality based on gender variable

Parameters	Gender	X	Ss	df	t	p
Openness to experience	Women	2.9563	.55	533	-0.43	.966
	Male	2.9587	.61			
Conscientiousness (self-control)	Women	3.7406	.66	533	3.576	.000*
	Male	3.5173	.66			
Extraversion	Women	3.2313	.52	533	.264	.792
	Male	3.2160	.64			
Agreeableness	Women	3.9094	.84	533	-1.196	.232
	Male	4.0040	.83			
Emotional instability (neuroticism)	Women	2.5219	.79	533	-1.189	.235
	Male	2.6173	.87			
Personality Scale	Women	3.2719	.29	533	.272	.786
	Male	3.2627	.38			
Exercise Addiction	Women	3.5625	.77	533	-2.380	.018*
	Male	3.7387	.78			

*p<0.05

sports for 6 or more years show more agreeableness than those who have been doing sports for 1-5 years. There is a statistically significant difference in the exercise addiction levels of the students. Those who have been doing sports for 6 and more years have higher levels of exercise addiction than those who have been doing sports for 1-5 years ($p<0.05$).

Table 4 shows the t-test results depending on whether the students have an athlete license or not. Accordingly, while there was a statistically significant difference between the groups in extaversion and agreeableness sub-dimensions ($p<0.05$), no significant difference was found in openness to experience, conscientiousness (self-control), emotional instability (neuroticism) and personality scale ($p>0.05$). In the extraversion sub-dimension, the mean scores of those who did not have an athletic license were higher than those who did, while in the agreeableness sub-dimension, the mean scores of those who had a license were higher than those who did not. It was observed that there was a statistically significant difference between whether the students had an athlete license or not and exercise addiction. Those who have an athlete

Table 3. T-test results of students' exercise addiction and personality based on training age

Parameters	Training Age	X	Ss	df	t	p
Openness to experience	1-5 years	2.9821	.59	533	.883	.377
	6 and more years	2.9364	.59			
Conscientiousness (self-control)	1-5 years	3.6250	.70	533	1.336	.182
	6 and more years	3.5477	.63			
Extraversion	1-5 years	3.2718	.65	533	1.835	.067
	6 and more years	3.1749	.57			
Agreeableness	1-5 years	3.8274	.86	533	-3.914	.000*
	6 and more years	4.1078	.78			
Emotional instability (neuroticism)	1-5 years	2.5734	.85	533	-.394	.694
	6 and more years	2.6025	.84			
Personality Scale	1-5 years	3.2560	.34	533	-.576	.565
	6 and more years	3.2739	.36			
Exercise Addiction	1-5 years	3.5611	.82	533	-3.498	.001*
	6 and more years	3.7972	.73			

*$p<0.05$

Table 4. T-test results of students' exercise addiction and personality based on being a licensed athlete

Parameters	Being a licensed athlete	X	Ss	df	t	p
Openness to experience	Yes	2.9608	.55	533	.111	.911
	No	2.9551	.64			
Conscientiousness (self-control)	Yes	3.5951	.66	533	.382	.702
	No	3.5730	.66			
Extraversion	Yes	3.1399	.54	533	-3.082	.002*
	No	3.3015	.66			
Agreeableness	Yes	4.0970	.71	533	3.387	.001*
	No	3.8539	.93			
Emotional instability (neuroticism)	Yes	2.6455	.85	533	1.548	.122
	No	2.5318	.83			
Personality Scale	Yes	3.2877	.32	533	1.440	.151
	No	3.2431	.38			
Exercise Addiction	Yes	3.7896	.68	533	3.072	.002*
	No	3.5820	.86			

*$p<0.05$

license show more exercise addiction than those who do not (p<0.05).

Table 5 shows the results of the ANOVA test based on the age variable. According to this, no significant difference was found in the mean of the personality scale with its sub-dimensions depending on the age variable (p>0.05). However, a significant difference was found in exercise addiction (p<0.05), and as a result of the Tukey and Scheffe test performed to understand between which groups this difference was between, it was understood that the exercise addiction levels of those aged 21 years and over were higher than those aged 17-18 years and 19-20 years.

Table 6 shows the correlation table for the relationship between exercise addiction and personality. Accordingly, there was a significant positive correlation between exercise addiction and agreeableness sub-dimension and personality scale mean (p<0.01). In addition, there was a positive and insignificant relationship between exercise addiction and openness to experience, conscientiousness (self-control) and extraversional sub-dimensions, and a negative and insignificant relationship with emotional instability (neuroticism) sub-dimension (p>0.05).

Table 7 shows the results of regression analysis on the effect of students' personalities on exercise addiction. In Model 1, it was seen that there was a significant negative interaction of openness to experience, conscientiousness (self-control) and emotional instability (neuroticism) sub-dimensions and a significant positive interaction of extraversion and agreeableness sub-dimensions on students'

Table 5. Results of exercise addiction and personality ANOVA test depending on students' age variable

Parameters	Age	X	Ss	F	p	η2
Openness to experience	17-18 years	2.88	.66			
	19-20 years	2.93	.57	2.168	.115	.008
	Age 21 and over	3.02	.58			
Conscientiousness (self-control)	17-18 years	3.66	.69			
	19-20 years	3.60	.67	1.972	.140	.007
	Age 21 and over	3.51	.63			
Extraversion	17-18 years	3.26	.69			
	19-20 years	3.19	.60	.417	.659	.002
	Age 21 and over	3.22	.57			
Agreeableness	17-18 years	3.83	.93			
	19-20 years	3.95	.80	2.808	.061	.010
	Age 21 and over	4.07	.81			
Emotional instability (neuroticism)	17-18 years	2.61	.84			
	19-20 years	2.64	.84	1.615	.200	.006
	Age 21 and over	2.50	.85			
Personality Scale	17-18 years	3.25	.40			
	19-20 years	3.26	.33	.052	.949	.000
	Age 21 and over	3.26	.35			
Exercise Addiction	17-18 years	3.58	.78		.011*	.017
	19-20 years	3.62	.80	4.544	Tukey	3-1-2
	Age 21 and over	3.81	.74		Scheffe	3-1-2

*p<0.05

Table 6. Correlation table between personality and exercise addiction

Parameters		Openness to experience	Conscientiousness (self-control)	Extraversion	Agreeableness	Emotional instability (neuroticism)	Personality Scale
Exercise Addiction	r	.024	.017	.059	.397**	-.044	.199**
	p	.573	.698	.176	.000	.311	.000
	n	535	535	535	535	535	535

**p<0.01

Table 7. Regression analysis results on the effect of personality scale sub-dimensions on exercise addiction

Parameters		R^2	ΔR^2	β	t	F
Model 1	Openness to experience	.182	.174	-.030	-.752	23.511**
	Conscientiousness (self-control)			-.026	-.648	
	Extraversion			.163	3.921	
	Agreeableness			.433	10.632	
	Emotional instability (neuroticism)			-.033	-.816	

**p<0.01

exercise addiction levels. It was also found that the sub-dimensions of the personality scale explained approximately 18% of the students' exercise addiction.

Discussion

The study aimed to examine the relationship between personality traits and exercise addictions of university students. Firstly, exercise addictions and 5-factor personality traits of the students were examined depending on gender (Table 2), years of doing sports (Table 3), whether they have an athlete license (Table 4) and age (Table 5). Then, the relationship between exercise addictions and personality traits (Table 6) was examined and the effect of personality traits on exercise addiction (Table 7) was tried to be revealed.

In the study, a significant difference was found in terms of students' exercise addictions and conscientiousness (self-control), one of the personality sub-dimensions, depending on the gender variable, while no significant difference was found in personality scale mean and other sub-dimensions. Accordingly, it was understood that men had higher levels of exercise addiction than women, while women had higher levels of conscientiousness than men. Similar to our study, Cicioğlu et al. conducted a study on elite athletes and sports sciences faculty students and found that men had higher exercise addiction levels than women [5]. In addition, in the study conducted by Hamer and Karageorghis, the level of exercise addiction was found to be higher in men [38]. In contrast to our study, it was also observed that there were studies in which there were no differences in the gender variable [39, 17, 40]. These differences are thought to be due to the sample group. In terms of personality traits related to gender variable, Tatlılıoğlu found a significant difference in the emotional instability (neuroticism) sub-dimension in his study on university students, while no significant difference was found in other sub-dimensions [41].

In our study, there was a significant difference in exercise addiction depending on the year of doing sports (training age). Accordingly, it was understood that those who have been doing sports for 6 or more years have higher levels of exercise

addiction compared to those who have been doing sports for less years. Similar to our study, it has been observed that there are many studies showing that the level of exercise addiction increases as the years of doing sports increases [5, 42, 43, 44]. Our and these studies show that doing sports regularly can reach the level of addiction, which can be considered a psychological and social problem as the years progress. For this reason, the duration and frequency of exercise should be kept under constant control. When the personality traits were analyzed according to the year of practicing sports, it was seen that there was a significant difference in the agreeableness sub-dimension, while no significant difference was found in the other sub-dimensions and the total scale. It is thought that this situation may be due to the experience of people in life over the years rather than the year of doing sports.

It was observed that there were significant differences between the exercise addictions of the students according to whether they had an athlete license or not. Accordingly, it was seen that those who had an athlete license had higher levels of exercise addiction than those who did not. It is thought that this situation is due to the fact that the exercise habits of licensed athletes, which they have acquired due to their regular training, turn into addiction. Similar to our study, in the study examining the differences in exercise addiction between elite athletes and students, the exercise addiction of elite athletes was higher [5]. In contrast to our study, in the study conducted by Arslanoğlu et al. on students studying in the coaching department, no difference was found in terms of whether the participants were licensed or not [3]. In our study, when the differences in terms of their personalities according to whether they had an athlete license or not were examined, a significant difference was found in the extraversion and agreeableness sub-dimensions, while no significant difference was found in the other sub-dimensions and scale mean. While the agreeableness levels of licensed athletes were high, the extraversion levels of unlicensed students were found to be high. In the study conducted by Eraslan on students studying in the sports department, significance was found only in the openness to experience sub-dimension, while no significance

was found in other sub-dimensions [45].

When the differences between the exercise addictions and personalities of the students depending on the age variable were examined, it was seen that there was no significant difference in the mean and sub-dimensions of the personality scale, but there was a significant difference between exercise addictions. Accordingly, it was seen that those aged 21 and over had higher levels of exercise addiction than those younger than themselves. In the study conducted by Cicioğlu et al., a significant difference was found in terms of elite athletes according to age variable, while no significant difference was found in terms of students [5]. Contrary to our study, there are also studies in the literature where no significant difference was found [40, 43]. It is thought that the lack of a significant difference in terms of personality is due to the closeness of the age groups.

In the literature, many studies examine the relationship between exercise addiction and personality [46, 47, 48, 49]. In the study conducted by Hausenblas & Giacobbi on non-athlete university students, it was reported that exercise addiction had a positive relationship with extraversion, neuroticism and agreeableness and a negative relationship with openness and conscientiousness [46]. In the study conducted by Costa & Oliva on gym users [47], it was reported that there was a positive relationship with all sub-dimensions of personality. In the study conducted by Kern with participants from universities and sports centers, it was reported that there was a negative relationship with extraversion and a positive relationship with neuroticism, agreeableness, openness and conscientiousness [48]. In our study, exercise addiction was found to have a positive significant relationship with agreeableness and scale mean, a positive significant relationship with extraversion, conscientiousness and openness, and a negative insignificant relationship with neuroticism.

In the study, in order to evaluate the effect of personality traits on exercise addiction, a model with personality sub-dimensions was created. When the model was examined, it was seen that exercise addiction had a negative interaction with openness to experience, conscientiousness (self-control) and emotional instability (neuroticism) and a positive interaction with extraversion and agreeableness and the model explained exercise addiction by 18%. In the study conducted by Andreassen et al. on university students, it was reported that the model created with the sub-dimensions of openness, conscientiousness, neuroticism, agreeableness and extraversion together with the independent variables of age and gender explained 16.4% of exercise addiction [50], which is similar to our study. Again, Cook et al. reported that personality traits can explain exercise addiction by 36% at the end of 3 models [51].

Conclusions

As a result of the study, it was observed that being male and being a licensed athlete increased the level of exercise addiction, and it was also observed that doing sports for a long time and with age, the exercise habit turned into addiction. Personality traits were found to have a positive relationship and effect on exercise addiction. Especially being Agreeableness was found to be effective on the level of exercise addiction.

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Conflict of interest

The authors declare no conflict of interest.

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Improvement of students' physical fitness in physical education classes using CrossFit means

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Abstract

Background and Study Aim	The purpose of the study is to develop and experimentally substantiate the efficiency of methods to improve the physical fitness (PF) of students in physical education classes using CrossFit means.
Material and Methods	The studies were conducted at the University with first-year students and involved 44 students of the control group and 52 students of the experimental group aged 17 to 19 years. Three versions of the experimental program to improve the students' PF in physical education classes using CrossFit means were developed. The students' PF level was determined according to the results of performing the State tests of the Ministry of Education and Science of Ukraine: 100 m running (s), standing long jump (cm), pull-ups and cross bar dips (number); hanging leg raises to the crossbar (number); 1000 m running (min, s); shuttle run 4x9 m and 10x10 m (s); trunk forward bending (cm). The level of students' functional fitness was determined according to the indices of heart rate (HR), blood pressure, time of breath-holding while performing Stange's test, lung vital capacity.
Results	In the process of the pedagogical experiment more pronounced positive changes in the indices of physical and functional fitness were observed in students of the experimental group as compared to those of the control group, the functional reserves of the heart and motor system of students increased by the end of the experiment. The efficiency of four-hour classes a week according to the experimental program manifested itself in the increase of strength, strength endurance, speed and agility during a performance of motor tests; a decrease in resting heart rate, an increase of the degree of HR increment under load (relative to the resting level), an increase of HR recovery at the first minute after the load. Mathematical models of interrelations of separate somatic and vegetative parameters in the process of development and improvement of motor skills under the influence of the experimental program of physical education with the use of CrossFit means were developed and specified. Mathematical models reflect mechanisms of increase of functional reserves of heart and motor system of students, their interrelation in the process of improving the results in motor tests under the influence of CrossFit means.
Conclusions	The results of the research confirm the higher efficiency of the physical education experimental method with the use of specially developed complexes of CrossFit® physical exercises in comparison with the generally accepted program of the Ministry of Education and Science of Ukraine. The efficiency of the experimental program's impact on the physical state of the students is confirmed by an increase in the level of development of motor qualities, an increase in the economy of the body functioning at rest, an increase in the functional reserves of the heart and the motor system.
Keywords:	students, motor qualities, functional state, CrossFit, models.

Introduction

The efficiency of the educational process increases in higher education institutions, the intensification of students' independent work, and an increase in mental stress have acutely raised the question of introducing new means of physical education and sports in the daily life of students.

Studies [1, 2, 3, 4] have shown a decrease in the physical health levels of students and graduates of higher education institution. Almost half of the studied students do not meet the average standard of physical fitness, which guarantees stable health [4].

The negative role in reducing the level of physical health, functional state and adaptive capacities of students is played by such factors as hypodynamia and hypokinesia, excessive emotional stress, irrational nutrition, decreased motivation

to systematic physical activity and other reasons [5, 6, 7, 8]. The improvement of physical education efficiency of students necessitates the solution of several scientific problems associated with the substantiation of more rational forms, means, and methods to optimize physical fitness, work capacity, and health of different population categories [1, 5, 9, 10].

Nowadays, traditional forms of physical exercise sessions are no longer satisfying people to the full extent. That is why, many new, popular and effective forms are emerging. One such modern technology is the high-intensity functional training CrossFit®, founded by Greg Glassman in 2000 [9, 11, 12], which has spread around the world.

Initially, CrossFit was considered an exercise system to improve physical condition, but soon it turned into a "fitness sport", representing a complex synthesis of several sports events or sports games [9, 12, 13, 14]. CrossFit is a powerful motivation means for high-intensity functional training of young people [15, 16, 17], a means of increasing strength, aerobic and anaerobic capacities [17, 18, 19] and strengthening youth health [13, 14]. Despite a sufficient number of works confirming the effectiveness of the CrossFit® system impact on the body of students [2, 17, 18, 19], the studies of foreign and national (Ukrainian) authors lack a comparison of the efficiency of different youth physical training programs. The published works present scattered information on the impact of CrossFit means upon the components of the physical condition of the trainees - physical development, motor qualities, functional state, and health status [13, 14, 20].

At the same time, not only the specificity but the direction of changes in the key components of physical condition as well are incompletely disclosed in the dynamics of long-term adaptation to CrossFit training [13, 14, 21]. The systemic mechanisms of integration and interaction of physical condition components determining the motor capacities of young people in the process of adaptation to physical loads during the CrossFit® program realization in the dynamics of the learning experiences of physical education have been the least analyzed in the scientific literature [4, 14, 18, 22]. Therefore, a deeper differentiated study and experimental testing of the impact of CrossFit® classes on the physical condition of higher education institution students of different gender, age, and fitness levels is of great current interest.

These unresolved questions reduce the efficiency of control, assessment, management, correction, and prediction of the physical condition, or its individual components in the dynamics of the development of students' motor capacities [18]. In this regard, the problem of developing effective methods for the improvement of students' physical fitness (PF) and revealing the mechanisms and principles underlying the improvement of their motor capacities, an increase of functional reserves, and health promotion is quite topical. The solution of this problem would further optimize the learning process of students and increase the efficiency of their professional activities in the future.

The purpose of the study is to develop and experimentally substantiate the efficiency of methods to improve the physical fitness of students in physical education classes using CrossFit® means.

Materials and Methods

Participants

The experiment involved 96 students of the National University of Life and Environmental Sciences of Ukraine aged 17-19 years. All students agreed to participate in the experiment. Study protocol was approved by Ethic Committee of the National University of Life and Environmental Sciences of Ukraine (Kyiv, Ukraine). The research was fulfilled in compliance with WMA Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects [23].

Research Design

We developed a method to improve physical qualities [1] and a targeted program of physical training using the CrossFit® method to increase the effectiveness of the pedagogical process of physical education in higher education institutions. The pedagogical experiment envisaged determining the efficiency of the developed method to improve the motor qualities and functional fitness of students. The boys of the experimental group (EG) had classes according to the experimental method, which included the use of CrossFit® means. The boys of the control group (CG) had practical classes once a week conducted according to the generally accepted program.

Practical classes for the boys of the EG were conducted twice a week (one pair of exercises according to the schedule, and the second – independent sessions under the guidance of the teacher). The main purpose of the former was to adapt the students' bodies to physical loads and master the correct technique for performing basic exercises. The experimental methods consisted of three variants of CrossFit® workouts.

The first version was conducted in the gym and included jogging, rope skipping, arm flexion and extension in a supine position, sit-ups, squatting, pull-ups, and 10-15 kg barbell bent-over rows. Each exercise was performed for one minute using the circuit training method. *The second version was conducted in the gym* and included jogging, rope skipping, arm flexion and extension in supine position (legs on a gymnastic bench), sit-ups with hands behind the head, 10 kg barbell bent-over rows, 15-20 kg barbell squats, 20-30 kg bench press. Each

exercise was performed for 2 minutes. Each student performed this set of exercises in two rounds. After the first round, the students had a two-minute rest, after which the set of exercises was performed again.

The third version was conducted in the stadium and included 400 (800) m jogging, lunges – 10 (15) reps of each leg, throwing 8 kg weights with back to the throwing section – 10 (15) reps, leg raises in the supine position - 30 to 60 repetitions, pull-ups – 8 to 12 repetitions, 24 kg kettlebell shot put – 8-15 repetitions. The number of each exercise repetitions was determined by the students themselves depending on their level of physical fitness. The intensity of classes in the experimental group constituted 60-70% of the maximum allowable HR at the beginning of the academic year. The volume and intensity of physical load increased steadily up to 75-95%. The duration of the training session was 80 minutes, of which 15 minutes were allocated for the CrossFit® physical training program.

Each version of CrossFit® was performed for two months with a gradual increase in the number of rounds depending on the stage of the version execution (from one at the beginning to three at the end of the academic year). The level of physical fitness (PF) of students was determined according to the State tests. The following test exercises were used to determine the level of motor skills development: 100 m (s) running for, standing long jump (cm), pull-ups and cross bar dips (number); leg raises to the bar from the hang position (number); 1000 m (min, s) running; shuttle run 4 x 9 m (s) and 10x10 m; trunk forward-downward bending (cm).

The level of student's functional fitness was determined according to heart rate (HR), blood pressure, breath holding time during the performance of Stange's tests [24] and vital capacity (VC). HR was recorded in different physiological states of the student's body during muscular activity: at rest, during the warm-up, during and after exercise.

Indices of functional fitness were recorded before, during, and at the end of the experiment, those of physical fitness - before and at the end of the experiment.

Statistical Analysis

Data were analysed by using STATISTICA 13.5 software package. During experimental material processing the methods of variation statistics, correlation, regression, and dispersion analysis were used. Mean values of the studied indices ($X\pm m$), correlation (r) and determination coefficients (r^2, d) were determined, parameters of regression and dispersion analysis were calculated. In the process of regression and dispersion analysis mathematical models of interrelations of physical fitness and functional state indices of students were developed in the dynamics of the experiment.

Results

Below are presented PF indices of the boys of CG and EG before and after the pedagogical experiment (Table 1).

Table 1. Comparative characteristics of physical fitness indices of the 1st year young men of CG and EG before and after the pedagogical experiment

Conditions		100 m running, s (Speed)		1000 m running, min., s (Endurance)		Standing long jump, cm (Speed-strength qualities)		Pull-ups, number (Strength)		4x9 m shuttle running, s (Agility)		Standing trunk bending, cm (Flexibility)	
		Physical fitness indices											
Groups		EG	CG	EG	CG	EG	CG	EG	CG	EG	CG	EG	CG
n		52	44	52	44	52	44	52	44	52	44	52	44
Before experiment	M	14.0	13.7	3.53	3.56	227.3	221.5	9.8	10.1	9.2	9.5	6.7	5.9
	±m	0.19	0.21	0.11	0.13	1.17	1.75	0.69	0.83	0.05	0.08	0.38	0.47
After experiment	M	13.3	13.4	3.25	3.41	249.4	238.7	12.3	10.9	8.9	9.3	9.1	7.3
	±m	0.12	0.17	0.07	0.15	2.09	2.67	0.46	0.71	0.07	0.12	0.72	0.83
Changes	%	-5	-2.2	-6.8	-4.5	9.7	7.8	25.5	7.9	-3.3	-2.1	35.8	23.7
t Student's		3.11	1.11	2.15	0.76	9.23	5.39	3.01	0.73	3.49	1.39	3.30	2.02
P		< 0.001	> 0.01	< 0.01	> 0.05	< 0.001	< 0.001	< 0.001	> 0.05	< 0.001	< 0.05	< 0.001	< 0.05

Note: The values are expressed as mean (M), standard error (±m), experimental group (EG), control group (CG).

The analysis of the experimental data revealed that by the end of the academic year, the classes with the use of CrossFit® means contributed to the improvement of the PF level of the EG students. Statistically significant positive changes were observed in all PF indices (Table 1).

The most pronounced positive changes in the EG students occurred in the results of 100 m running, long jump, pull-ups, standing trunk bending, and 4x9 m shuttle running. This is confirmed by the difference between the indices and the level of statistical significance (p<0.001).

In students of the CG, statistically significant positive changes occurred in the results of standing long jump (p<0.001), 4x9 m shuttle running, and standing trunk bending (p<0.05). However, these changes in the PF indices were less pronounced in the boys of CG than in those of EG.

Only a tendency to the improvement of the results in 100 and 1000 m running and pull-ups was noted in the CG students by the end of the experiment (Table 1).

In general, the changes in the studied PF indices of students in the course of the experiment indicate that the influence of the traditional university program of physical education on the body of CG students is less efficient than that of the experimental program on the body of EG students.

Below is presented the analysis of materials of research on the functional fitness of CG and EG young men (Table 2) during the academic year (before and after the experiment).

Changes in functional indices as well as those of PF indicate that the experimental program is more effective than the generally accepted university program of physical education.

The experimental program significantly improved the functional state of the body of the EG students by the end of the academic year. The most pronounced changes occurred in such physiological indices as HR, VC, breath holding time during the Stange's and Genche's tests. The CG students, on the other hand, showed only a tendency to their functional state improvement.

It is characteristic that blood pressure indices changed insignificantly in both groups.

In general, the impact of the experimental program on the physical state of the EG students turned out to be more effective than the influence of the generally accepted program on the CG students.

Further analysis was aimed at determining the specifics of interrelations between functional indices and the level of development of individual motor qualities in the process of their improvement during the implementation of the CrossFit® program.

To that end, the changes of HR in different physiological states during muscular activity and its interrelation with the level of individual motor qualities manifestation in the beginning and at the end of the experiment were analyzed in some of the CG subjects.

Figure 1 shows changes in resting heart rate, during the warm-up, during the main part of the CrossFit® session, and in the recovery period after exercise in the dynamics of the pedagogical experiment (Fig. 1).

The changes in heart rate shown in Figure1 reflect its statistically significant decrease in each part of the session under the influence of the experimental program. This indicates the efficiency of the CrossFit® program impact on the functional state of students' cardiovascular systems.

Table 2. Comparative characteristics of functional fitness indices of the 1st year students of CG and EG before and after the pedagogical experiment

Indices of body system functional activity	Initial indices	Groups	n	Before experiment	After experiment	Changes	P
				M ± m	M ± m	%	
Systolic blood pressure, mm Hg.	111.6 ±1.37	EG	52	113.0±3.43	113.8±3.34	-0.7	> 0.05
		CG	44	118.3±4.13	121.2±3.51	-2.5	> 0.05
Diastolic blood pressure, mm Hg	69.5±0.80	EG	52	70.7±2.20	71.5±2.52	-1.1	> 0.05
		CG	44	71.6±2.10	73.0±2.14	-2.0	> 0.05
Heart rate bt/min	77.6 ±1.05	EG	52	83.5±2.31	76.2±2.73	8.7	< 0.01
		CG	44	82.7±2.38	80.5±2.30	2.7	> 0.05
Vital capacity, ml	3377.0±87.2	EG	52	3260.7±119.3	3571.4±89.5	-9.5	< 0.01
		CG	44	3312.5±134.9	3004.2±129.5	9.3	> 0.05
Stange's test, s	57.3±2.36	EG	52	55.6±4.09	69.9±3.54	-25.7	< 0.01
		CG	44	52.6±4.19	48.4±3.82	8.0	> 0.05
Genche's test, s	38.8±1.62	EG	52	37.7±3.04	44.1±2.74	-17.0	< 0.05
		CG	44	35.8±4.22	34.7±2.56	3.1	> 0.05

To clarify the adaptive mechanisms underlying the increase in PF level of the subjects during CrossFit® training, the correlations of HR with the level of developing individual motor qualities during the experiment were analyzed (Fig. 2).

Figure 2 shows correlation coefficients reflecting the interrelations of students' PF parameters with HR recorded before, during, and in the recovery period after physical loads (Fig. 2).

Values of paired correlation coefficients and their direction reflect a different degree of HR interrelations during different physiological states with PF indices of students in the process of the experiment.

Statistically significant pair correlations served as the basis for further graphical, regression, and variance analysis of the identified interrelations. The purpose of this analysis is to examine the physiological mechanisms providing the development and improvement of motor qualities
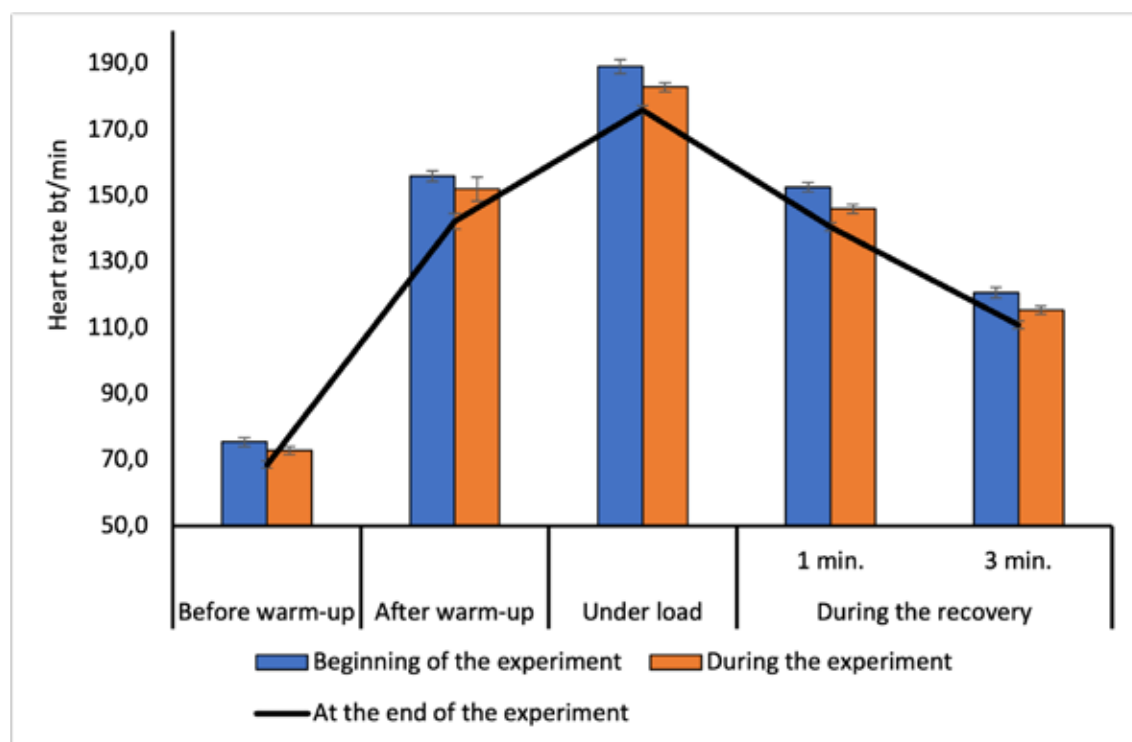

Figure 1. Changes of HR in different physiological states during muscular activity – at the beginning, during, and at the end of the experiment
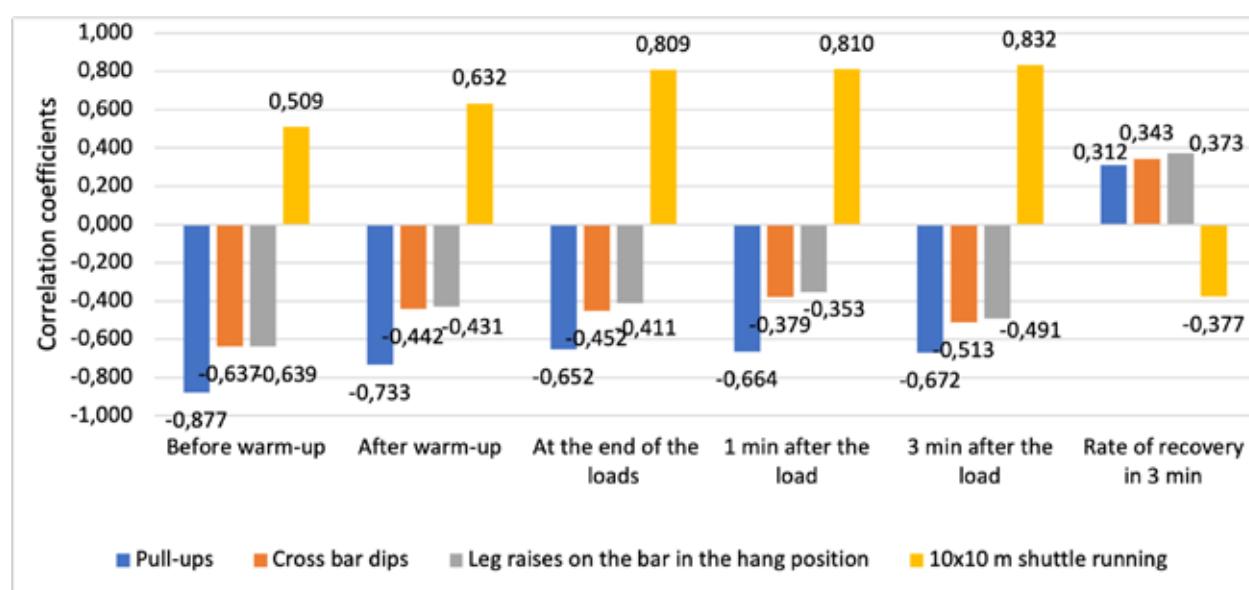

Figure 2. Interrelations of physical fitness parameters of students with HR recorded before, during and in the recovery period after physical load. Note: statistically significant correlations r≥0.377.

(MQs) during CrossFit® training.

The results of the graphical and regression analysis presented in Figure 3 demonstrate that a decrease in resting HR during the experiment is accompanied by an increase in the degree of its increment (Fig. 3a), a decrease of its maximum values during CrossFit® physical loads (Fig. 3b), and an increase in the number of pull-ups (Fig. 3c).

An increase in resting heart rate, on the other hand, is accompanied by a decrease in the degree of its increment under loads (Fig. 3a), an increase in its maximum values (Fig. 3b), and a decrease in the number of pull-ups (Fig. 3c).

It is characteristic that an increase in HR increment during exercise in relation to resting heart rate is accompanied by an increase in the number of pull-ups (Fig. 3d).

Changes and correlations of the studied indices indicate that the result in the motor test depends both on the value of HR at rest, and the degree of its increment under load in relation to the HR recorded before physical load.

The analysis of variance showed that the 4-hour physical education program implemented in the EG is the key factor changing both resting heart rate values and its increment during the experiment (Fig.4a). The average HR values grouped according to the experiment stages in Figure 4a, reflect a linear decrease in resting HR and an increase of its increment under loads in the dynamics of the experiment.

It was found that the resting heart rate decreased under the influence of the CrossFit program. The coefficient of determination (d = 0.691 F=29.6; p < 0.00001) indicates that 69.1% of the total variability of resting HR is due to the influence of the experimental program (Fig. 4a). 37.5% of resting HR variability is determined by factors not accounted for in this experiment.

40.6% of the total variation of HR increment under load was due to the direct impact of the CrossFit® program used (d=0.406; F=7.18; p=0.002).

Analysis of variance revealed that the increase in HR increment under load also depends on the initial values of resting HR: the lower the resting HR, the greater its increment during exercise and vice versa (r=-0.712, p<0.001) (Fig. 4b). The sample coefficient of determination (d=0.506. F=20.0, p=.00000) indicates that 50.6% of the total variation of HR increment during exercise is determined by
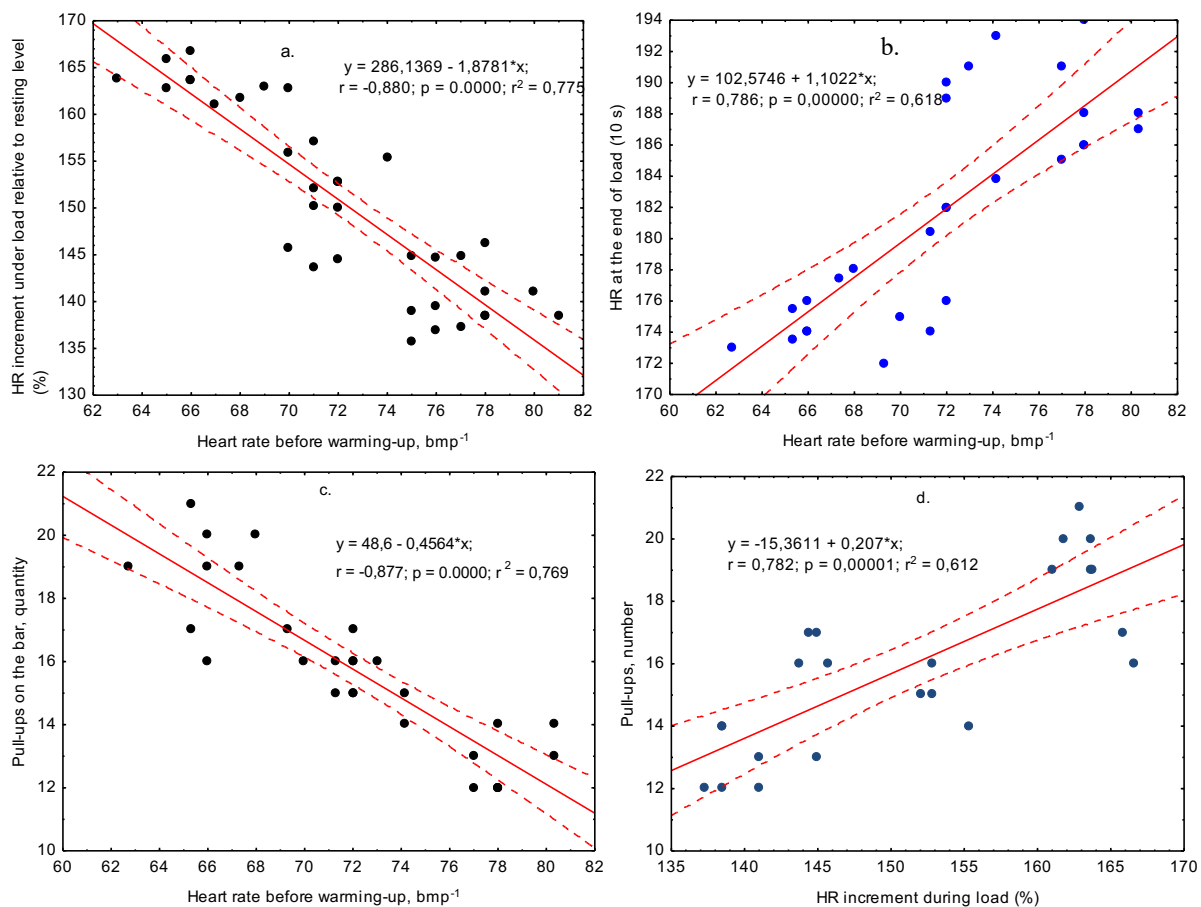

Figure 3. Correlations of HR in different states during muscular activity with each other and the number of pull-ups.

the influence of resting HR.

It is noteworthy that the rate of HR recovery increased at the first minute after load under the influence of the experimental program (Fig. 4c). The impact of the CrossFit® program can explain the variability of only 40.6% of the total variance in HR rate recovery after load (d = 0.406; F=12.6, p=0.00007).

The revealed dependencies indicate that the experimental program influences the HR increment both directly, through activation of motor-cardiac reflexes during exercise, and through enhancement of vagus nerve tone, which slows the heart performance and economizes body functions at rest. This reflects one of the mechanisms of increasing the functional reserves of the cardiovascular system.

The following step-by-step regression analysis allowed determining the key (out of the recorded) functional parameters and their interrelations, which to the greatest extent determine the PF of the subjects during the execution of individual motor tests.

Mathematical models of the result in motor test dependence on the HR values recorded in different physiological states of students' bodies during muscular activity are presented in Table 3.

Equation 1 (Y_1), presented in Table 2, shows that the strength training of students, assessed by the maximum number of pull-ups manifests dependence on the degree of HR increment during physical activity and the value of maximum HR under the load.

Analysis of the variance of this model parameters demonstrated that 79.8% of the total variation of the number of pull-ups is associated with the degree of HR increment (in %) and the value of HR maximum during exercise (F = 51.7, p<0.00001).

However, the effect of each of these parameters on the result in the motor test tends to manifest differently.

An increase in HR increment during exercise, relative to the resting state, contributes to an increase in the number of pull-ups (r = 0.782, p = 0.00001). 61.2% of the total variance of the number of pull-ups was determined by HR increment during exercise (d = 0.612, p = 0.00001).

Modeling with Equation 1 showed that a 2% increase in HR increment during exercise at its steady maximal values was accompanied by a 3.10.05 increase in the number of pull-ups (t=4.7, p<0.001), whereas a 2% increase in HR maximal during exercise at its stability at rest was accompanied by
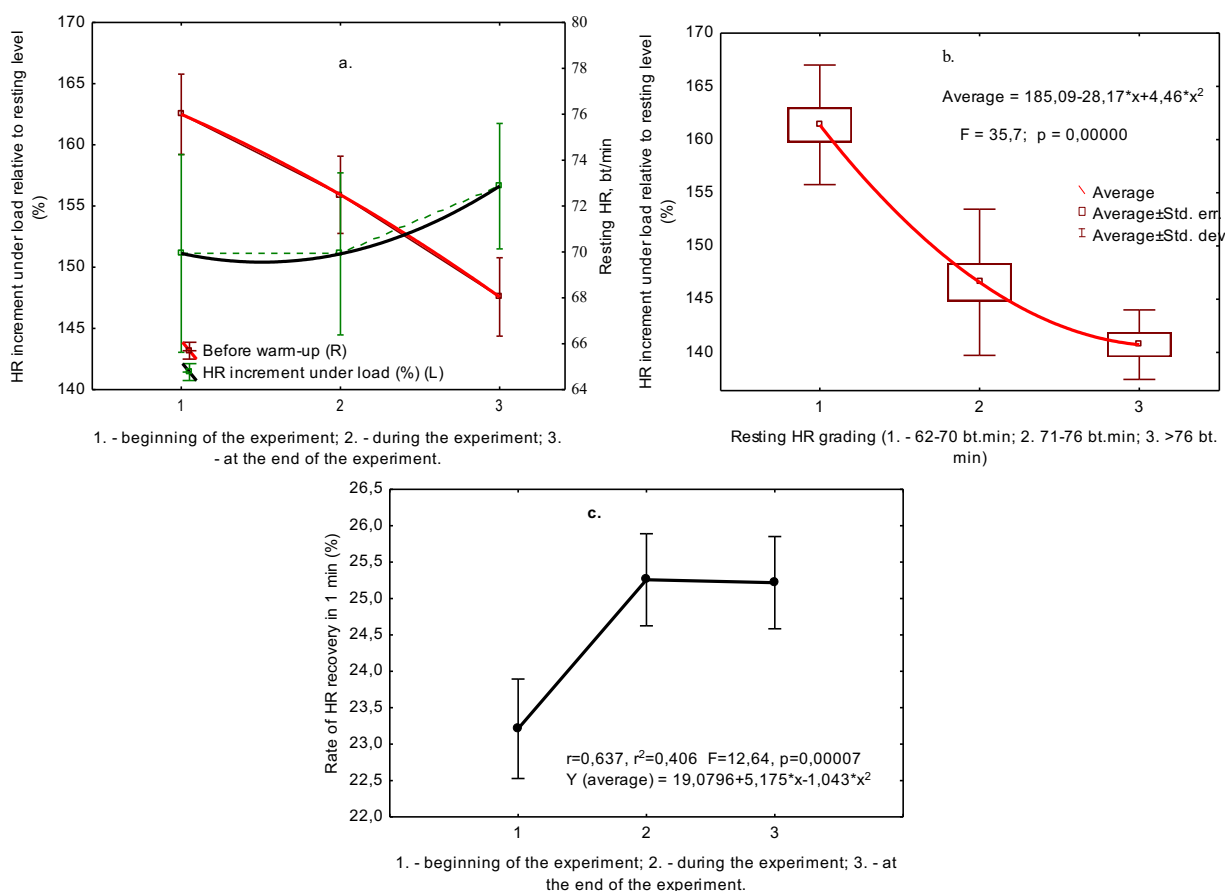

Figure 4. Analysis of variance of HR variation at rest and during muscular activity in the dynamics of the pedagogical experiment.

Table 3. Mathematical models of the result in motor test dependence on the HR values recorded in different physiological states of the body during muscular activity

№	Regression models	Determination coefficient, P
1.	$Y_1 = (33.71 + 0.137x_1 - 0.214x_2) \pm 1.26$	F=45.3, r = 0.893, d = 0.798, p < 0.0001
2.	$Y_2 = (61.8 - 0.6053 x_3) \pm 3.74$	F=17.7, r=-0.637, d=0.405, p<0.0003
3.	$Y_3 = (62.1 - 0.6178x_4) \pm 3.43$	r = -0.685, p = 0.00002, d = 0.469
4.	$Y_4 = (0.1747x_5 + 0.0766x_6 - 10.195) \pm 0.9$	r= 0.842, d= 0.709, F=29.2 p<.00000

Notes: Y1 - maximal number of pull-ups; x1 – HR increment (%) under load, %; x2 - maximal values of HR under load; Y2 - number of cross bar dips; x3 - HR before warm-up; Y3 - leg raises on the bar in the hang position, x4 - HR before the warm-up. Y4 - 10 x 10 shuttle running, sec; - x5 - HR at the end of load; x6 - % of HR under-recovery in 3 min.

a 3.60.03 decrease in the number of pull-ups (t=5.6, p<0.001).

Equation 2 (Y_2) presented in Table 2 reflects the dependence of the number of cross bar dips on the value of pulse recorded at rest.

Parameters of this model show that the lower the pulse at rest (before the warm-up), the greater the number of dips the subject performs. However, only 40,5% of the total variation of the result during the execution of dips is due to the influence of resting HR (d=0,405, F = 17,7, p<0.0003). The remaining 59.5% of variations of dips are determined by the impact of factors not taken into account in this regression model.

Regression model 3 (Y_3), presented in Table 2 (Y3), reflects the dependence of the result in maximal leg raises in the hang position on resting HR.

Parameters of this model are indicative that the higher the resting HR (before the warm-up), the lower the strength endurance of the subjects, and vice versa - the lower the resting HR, the higher the number of performed movements (r = -0.685, p = 0.00002).

The dependence reflected in this model indicates that only 46.9% of variations in the strength endurance index (d=0.469; F = 22.05, p<0.0003) are due to a decrease in resting HR by the end of the experiment. The remaining 53.1% of strength test values were determined by other factors.

Equation 4 (Table 2, Y_4) reflects manifested in the experiment dependence of shuttle run result on HR at the end of the exercise during CrossFit® training and the degree of HR under-recovery (in %) within 3 minutes after load. The parameters of this model show that the higher the increase in HR during CrossFit® sessions and the greater the degree of HR under-recovery at the third minute after load, the greater the time of performing a shuttle run (r= 0.842 d= 0.709, F=29.2, p<.00000) and vice versa. That is, the worse the result in the coordination test used to assess agility. The impact of these two factors, which are physiological markers of the functional fitness of the students' bodies, is responsible for the

variability of 70.9% of the total variance of the result in shuttle running (d= 0.709, F=29.2 p<.00000).

Discussion

The research materials presented in this article are a continuation of our earlier studies on the impact of PE means, CrossFit including, on the physical state of students [1, 18].

Part of our findings confirm the results of the studies of foreign and Ukrainian authors, who dealt with this problem, and part is completely new and complements them.

In particular, the positive impact of physical education classes using CrossFit® means on the functional fitness of students [13, 14, 20], the level of development of motor qualities [4, 14, 17], and physical work capacity has been confirmed [19, 21].

As a result of the implementation of our experimental program (using CrossFit® means), a positive impact of 4 hours per week of educational and specially organized physical education classes was revealed.

The results of studies in the CG are indicative that 2 hours of physical education classes per week, envisaged by the curriculum in higher education institutions of Ukraine, cause significantly less positive changes. They also fail to stimulate students' motivation to increase the level of PF and health promotion [3, 4, 6, 25].

More pronounced positive changes in the indices of functional and physical fitness occurred in the EG as compared to CG during the experiment.

The efficiency of four-hour classes a week according to the experimental program was manifested in the decrease of resting HR, the increase in HR increment under the load (in relation to the resting level), the increase in the rate of HR recovery in the first minute after the load, and the improvement of results in motor tests of the EG students.

The increase in the results in individual motor tests obtained in the course of the experiment reflects both an increase in the level of development of individual motor qualities (dynamic and explosive

strength, speed, strength and general endurance, agility, flexibility), and an improvement of individual forms of physical work capacity manifestation: strength – pull-ups and dips to exhaustion; general (aerobic-anaerobic) - 1000 m running.

The revealed changes indicate the improvement of physical and functional fitness levels, an increase of heart functional reserves, and the motor system of students in the course of the experimental program realization.

Correlation and determination coefficients, developed regression models reflect both the specifics of interrelation between cardiovascular and motor systems, and mechanisms of improvement of students' functional reserves ensuring improvement of results during the performance of motor tests under the influence of CrossFit® means.

The experimental material analysis showed that the main mechanism of *HR increment increase* during exercise at relative stability of its maximum values is the decrease in resting HR by the end of the experiment. This is also evidence of an increase in the economy of the body functioning as one of the criteria for improving functional reserves in the process of EG students' adaptation to experimental program loads [18].

The phenomenon of resting HR decrease can be considered as one of the mechanisms for increasing the functional reserves of the cardiovascular system, which contributes to a greater HR increment, as well as the strength endurance increase during the execution of pull-ups and dips.

The novelty of the materials obtained in the process of research consists of clarification, specification and supplement of the results of studies both our earlier ones [1, 18, 22], and those of Ukrainian [3, 4, 26, 27] and foreign [13, 14, 20] authors.

In particular, the advantage of the influence of circuit training, its specificity, and the number of classes per week on the development of motor qualities and functional state of students was substantiated in the process of pedagogical experiment.

The novelty of the performed work also includes the development and refinement of mathematical models specifying mechanisms of interaction of somatic and vegetative systems in the process of development and improvement of aerobic-anaerobic endurance (1000 m running), speed (100 m running), dynamic (pull-ups) and explosive (standing long jumps) power, agility (shuttle running), and flexibility.

Presented models are the basis for the development of a system of physical fitness evaluation and prediction, differentiated according to various criteria (training period, a functional state during muscular activity, etc.). However, this requires additional clarifying studies.

The CrossFit method allows optimizing the training process in accordance with the main objective of the training period or stage. It can also provide optimal load dynamics, expedient combinations of various means and methods of training. In addition, it enables to comply with pedagogical effect factors and to achieve the necessary continuity in the development of various abilities.

Conclusions

The results of the studies confirm the higher efficiency of the experimental method of physical education using specially designed complexes of CrossFit® physical exercises in comparison with the generally accepted program of the Ministry of Education and Science of Ukraine.

The CrossFit® method of circuit training increases the motor and emotional density of classes, makes them more diverse and effective for students, improves their functional state and physical fitness, and enhances the functional reserves of the heart and motor system.

The efficiency of the experimental physical education program using CrossFit® means is confirmed by: a) improved strength, strength endurance, speed, and agility during motor test execution; b) decreased resting HR; c) increased degree of HR increment during exercise (relative to the resting level); d) increased rate of HR recovery in the first minute after physical load.

The revealed dependencies between the indices of functional state and physical fitness of students show that the lower the resting HR, the higher its increment under the load, and the higher the recovery rate in the first minute after the load, the higher the result in motor tests and the level of development of physical qualities. These shifts are the criteria of students' functional fitness.

The developed mathematical and graphical models, formalizing the role, correlation, and interrelation of the key physical fitness indices, reflect the mechanisms of improving the economy of functioning and increasing the body functional reserves in the process of adaptation to the means of the experimental program. The developed models can be used for designing estimation scales of the students' physical state and predicting the level of their physical fitness in the process of physical education classes using CrossFit® means.

HR in different physiological states during muscular activity is one of the most accessible and informative biological markers of students' functional fitness during PE classes.

Conflict of interests

The authors declare that there is no conflict of interests.

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Kinesiophobia and fear avoidance behaviors in collegiate female athletes during menstruation

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Abstract

Background and Study Aim	The menstrual cycle can be a factor affecting performance in female athletes if accompanied by pain. In this study, authors aimed to examine how menstruation pain affects kinesiophobia and fear avoidance behavior in female athletes.
Material and Methods	Study included a total of 50 female athletes aged 18-35 years. The athletes were divided into 3 groups as Group 1 (With Pain), Group 2 (No Pain) and Group 3 (Intermittent Pain) according to their pain experience during menstruation. The groups were compared in terms of kinesiophobia and fear avoidance behaviors. Kinesiophobia was evaluated with the Tampa Kinesiophobia Scale (TKS), fear avoidance behaviors were evaluated by using Fear Avoidance Beliefs Questionnaire (FABQ).
Results	There was a significant difference between the 3 groups in terms of both TKS and FABQ scores ($p<0.05$). In terms of TKS, there was no significant difference between Group 1 and Group 3 ($p>0.05$), there was a significant difference between Group 1 and Group 2 and between Group 2 and Group 3 ($p<0.05$). There was a significant difference in favor of Group 1 in all pairwise comparisons in terms of FABQ scores ($p<0.05$). Pain intensity was associated with TKS and FABQ.
Conclusions	A significant majority of female athletes experienced pain during menstruation, exhibited kinesiophobia and fear avoidance behavior due to pain. Since kinesiophobia and fear avoidance behavior can be a limiting factor for the athlete's optimum performance, female athletes should be supported in order for them to develop coping methods.
Keywords:	athlete, kinesiaphobia, pain, menstruation

Introduction

In order for women to maintain their reproductive functions, changes occur periodically every month, especially in the genital organs, endocrine glands, and the whole organism during the period from menarche to menopause [1]. The period in which these changes occur is called the menstrual cycle. Physiological and periodically normal functioning of the cycle, which manifests itself with a menstrual bleeding in a 21-35-day period, occur with harmonious relations between the endometrium, ovary, anterior pituitary lobe, and midbrain system [2].

Menstruation is not a disease but an event that is the natural course of the organism and this process varies according to factors such as the person, environment, and climate. This period, which usually lasts 3-8 days, is known as the menstrual period. The menstrual cycle consists of four main phases: the menstrual phase, the follicular phase, the ovulation phase, and the luteal phase [3]. Physiological factors unique to women, such as the fluctuation of female sex hormone concentrations during different phases of the menstrual cycle, can be an important consideration for optimizing the performance and maintaining health of female athletes. It has been hypothesized that physical performance changes throughout a menstrual cycle due to various mechanisms such as variable muscle activation, thermoregulation, metabolism and body composition of the individual. Some uneasiness and physiological and emotional changes felt during this period have the potential to affect the course of sportive activity [4]. Although some female athletes feel a decrease in their physical capacity during the menstrual cycle, some female athletes who are able to cope with pain and similar problems caused by menstruation have performances crowned with Olympic medals during their menstrual periods [5].

While most performance-based research in sport science has focused on male athletes, the results of these studies have been inappropriately applied to female athletes [6, 7]. The impact of the menstrual cycle on physical performance needs to be explored as an important aspect for women's sport and it is a critical area for further research. In addition to the physiological, hormonal, and psychological changes that occur during menstruation, the experience of pain is also common [3]. Pain or related factors may occur during menstruation in the form of fear of movement (kinesiophobia) and fear avoidance behavior, which may affect women's sportive performance and success. As a result of increased

pain perception, the person is afraid to move and shows an avoidance reaction to cope with pain. In case of pain, the person may think that any activity will increase the pain and therefore they should avoid the activity. As the level of fear increases, the level of activity avoidance also increases. Pain-related fear is more inhibitory than pain itself [8]. After traumas and injuries, interventions may be inadequate because the individual avoids moving the traumatic area. Kinesiophobia and fear avoidance behavior are important problems in female athletes and inability to cope with it has the potential to affect functional activity level. Recognizing female athletes who exhibit kinesiophobia and fear avoidance behavior during menstrual periods and supporting them with appropriate strategies may contribute positively to their performance or prevent them from experiencing performance loss.

Hypothesis and Purpose. The main question of this study is whether female athletes exhibit kinesiophobia and fear avoidance behavior as a result of menstrual pain and pain intensity. The hypothesis of the study is that kinesiophobia and fear avoidance behavior occur in case of menstrual pain.

Material Methods

Participants

The study included female students aged 18-35 years performing various sports and attending at Inonu University Faculty of Sports Sciences.

The authors calculated the sample size using the G-Power 3.1.7 package program (Heinrich-Heine-Universität, Dusseldorf, Germany) with a type I error of 0.05 and a type II error of 0.2. The power of the test was set as 0.8. Based on the kinesiophobia value, the minimum number of participants required in the study for a 5-unit difference to be significant was determined as 18. The study included female students who volunteered to participate in the study and who had been regularly performing any sports for at least 3 months. Students with a diagnosis of chronic disease and a history of regular medication use were excluded from the study. Participants who could not complete the study or who wanted to leave the study voluntarily were excluded from the study. Participants were divided into 3 groups as those who experienced pain during menstruation (Group 1), those who did not experience pain (Group 2), and those who sometimes experienced pain (Group 3). The groups were compared in terms of sociodemographic characteristics, kinesiophobia, and fear avoidance behaviors.

Ethical Aspect of the Research

Ethics committee approval was obtained from the Inonu University Health Sciences Non-Interventional Clinical Research Ethics Committee (Decision No: 2022/3822). The study was conducted in accordance with the Principles of the Declaration of Helsinki. Parents/guardians of the children included in the study were informed in detail about the study and their written consent was obtained.

Research Design

This is a cross-sectional study.

Evaluation of Sociodemographic Characteristics

Participants' age, height, weight, age of starting sports, duration of performing sports (month/day), frequency of performing sports (day/week), sport branch they performed, length of menstrual cycle, length of bleeding period, and whether or not they had pain during menstruation were questioned with a case report. Participants were divided into 3 groups as those who experienced pain during menstruation (Group 1), those who did not experience pain (Group 2), and those who sometimes experienced pain (Group 3).

The questionnaire to be used in the evaluation and the questions asked in the case report were applied online via Google Forms. The fear of movement that may arise due to pain, tenderness, and emotional changes during menstruation was measured with the Tampa Kinesiophobia Scale (TKS) and the fear-avoidance of activity that may arise due to these reasons was measured with the Fear-Avoidance Beliefs Questionnaire (FABQ).

Assessment of Kinesiophobia

Miller et al. developed the TKS used to determine the level of kinesiophobia [9] and Yılmaz et al. established its Turkish validity and reliability.

The TKS is a 17-item questionnaire designed to assess kinesiophobia. Subjects are asked to indicate their level of agreement with each of the 17 statements on a 4-point response scale ranging from "strongly disagree" to "strongly agree". Results range from 17 to 68, with scores greater than 37 indicating a high degree of kinesiophobia. In addition to face and content validity, it has stability and internal consistency over time [11]. The questionnaire consists of 17 items to determine the anxiety of the person about injury as a result of exercise, whether the activity will harm the body in case of pain, and to what extent the pain affects the person.

Evaluation of Fear Avoidance Behaviors

Waddell et al. developed the FABQ in 1993 [12], and Bingül and Aslan established its Turkish validity and reliability [13].

The questionnaire consists of two parts with 16 questions in total. The first part with 5 items measures Physical Activity-related fear beliefs and the second part with 11 items measures Work-related fear beliefs. A 7-point Likert scale is used for scoring. The Physical Activity section has a minimum score of 0 and a maximum score of 24. The Work section has a minimum score of 0 and a maximum score of 42. As the total score increases in each section, fear avoidance beliefs increase. In

our study, the first 5 questions of the fear avoidance questionnaire, which includes beliefs about physical activities, were used. The respondent selects any score from 0 to 6 to indicate how much activities such as bending over, hanging an object, walking, or driving affect back pain. The questionnaire consists of items investigating whether pain is caused by physical activity, whether physical activity increases pain, and whether activities causing/increasing pain are performed.

Assessment of Pain Intensity

Pain intensity was questioned using the visual analog scale (VAS). Using a 10 cm line scale for pain severity according to the VAS, "no pain" was rated as 0 points and "worst pain imaginable" was rated 10 points [14].

Statistical analysis

Data evaluation was carried out in a computer environment using SPSS 22.0 package program (IBM, Armonk, NY, USA). The Shapiro-Wilk test was used to test whether the data were normally distributed. Since normality assumptions were not met, Kruskal-Wallis H test was used for numerical data and Chi-square test was used for categorical data. Post hoc analysis (Bonferroni-Dunn's test) was used for comparisons between groups. Spearman rank correlation coefficient was used in the correlation analysis. Significance level $p<0.05$ was taken.

Results

There was no statistical difference between the groups in terms of demographic characteristics (age, height, weight, and BMI), menstrual period characteristics (menstrual frequency and menstrual period duration) and sport-specific characteristics (sport branches and duration of performing sports) (Table 1, $p>0.05$).

Table 1. Comparison of the groups in terms of demographic and sport-specific characteristics

Descriptive Features (n=50)	Group 1 (n=20) Mean±SD Median (Min-Max)		Group 2 (n=13) Mean±SD Median (Min- Max)		Group 3 (n=17) Mean±SD Median (Min- Max)		Kruskal-Wallis H Test and p value
Age	22.10±3.24		22.69±3.30		22.29±1.89		1.817
	21 (19-31)		22 (20-32)		22 (19-26)		p=0.403
Height	164±0.05		164 ±0.04		161±0.04		4.290
	165 (155-174)		165 (159-172)		162 (154-168)		p=0.117
Weight	61.60±6.23		57.38±5.15		59.88±4.84		4.618
	63 (51-69)		56 (51-66)		60 (52-66)		p=0.099
BMI	22.81±2.26		21.31±1.69		23.01±2.05		6.044
	23.15 (19.20- 26.64)		20.83 (19.10- 25.78)		23.14 (19.10- 26.22)		p=0.050
Variable	n	%	n	%	n	%	Chi-Square test and p value
Frequency							
Less than 21 days	3	37.5	4	50	1	12.5	
21-35 days	16	39	9	22	16	39	x^2=4.945
More than 35 days	1	100	0	0	0	0	p=0.293
Duration of Menstrual Period							
1-3 days	4	23.5	4	23.5	9	53	x^2=5.683
4-7 days	15	46.9	9	28.2	8	25	
8-10 days	1	100	0	0	0	0	p=0.224
Sport Branches							
Ball sports	11	47.8	7	30.4	5	21.7	
Water sports	3	33.3	1	11.1	5	55.6	x^2=7.161
Defense sports	2	22.2	3	33.3	4	44.4	
Racket Sports	0	0	0	0	1	100	p=0.519
Other	4	50	2	25	2	25	
Duration of performing sports							
< 1 year	6	37.5	6	37.5	4	25	x^2=2.268
1-2 years	1	50	0	0	1	50	
> 2 years	13	40.6	7	21.9	12	37.5	p=0.687

n: Number of samples, % Percentage, SD: Standard Deviation, x^2: Chi-Square test BMI: Body Mass Index, p value; statistical significance, *$p<0.05$

There was a statistically significant difference between groups in terms of kinesiophobia and FABQ scores (Table 2, p<0.05). In terms of kinesiophobia, the highest score was recorded in Group 1 (pain group), while the lowest score was recorded in Group 2 (no pain group). In terms of fear avoidance beliefs, the highest score was again obtained in Group 1 and the lowest score was obtained in Group 2 (Table 2).

In pairwise comparisons between groups, a significant difference was found between Group 1 and Group 2 in favor of Group 1 and between Group 2 and Group 3 in favor of Group 3 in terms of both TKS and FABQ (p<0.05). There was no significant difference between Group 1 and Group 3 in terms of TKS (p>0.05), whereas a significant difference was found in favor of Group 1 in terms of FABQ (Table 3, p<0.05).

It was found that there was a moderate positive correlation between the duration of menstruation and kinesiophobia, and between the severity of pain, kinesiophobia and fear avoidance in the 1st group, which included the participants who experienced pain during menstruation (Table 4, p<0.05). There was no correlation between FABQ score and duration of menstrual period and frequency of menstruation (Table 4, p>0.05)

Discussion

In this study, we examined the effects of menstruation pain on kinesiophobia and fear avoidance behavior in female athletes, significant differences emerged between the groups, which supports the research hypothesis (p<0.05). The highest scores were observed in Group 1 in both FABQ and TKS results, while the lowest scores were observed in Group 2. This result supports our hypothesis and shows that the pain experienced during menstruation causes an increase in movement avoidance and fear of movement in female athletes. When the Group 3 values were analyzed, the results were more similar to Group 1, indicating that the frequency of pain experience increased kinesiophobia, although not in every period. Studies on kinesiophobia have mostly investigated problems such as chronic low back pain and knee pain, which makes daily activities of individuals difficult, and immobility may lead to chronic diseases, which may negatively affect the rehabilitation process [15].

Table 2. Comparison of the groups in terms of kinesiophobia and fear avoidance beliefs scores

Scales	Group 1 (n=20) Mean±SD Median (Min-Max)	Group 2 (n=13) Mean±SD Median (Min-Max)	Group 3 (n=17) Mean±SD Median (Min-Max)	*Test and p value	Comparison
TKS	38.10±8.61	14.53±2.93	35.88±5.93	29.096	Group1>Group3>Group2
	41 (20-50)	14 (11-19)	37 (26-45)	<0.001	
FABQ	19.45±1.76	4.69±1.10	13.00±2.17	41.725	Group1>Group3>Group2
	19 (17-23)	5 (2-6)	13 (9-19)	<0.001	

n: Number of samples, SD: Standard Deviation, TKS: Tampa Kinesiophobia Scale, FABQ: Fear Avoidance Behavior Questionnaire, *Kruskal-Wallis H test, p value; statistical significance, *p<0.05

Table 3. Pairwise comparisons between groups

Groups	TKS		FABQ	
	Difference of Means	*p value	Difference of Means	*p value
Group 1-Group 2	23.56	<0.001	14.75	<0.001
Group 2-Group 3	-21.34	<0.001	-8.30	<0.001
Group 1-Group 3	2.22	0.742	6.54	<0.001

TKS: Tampa Kinesiophobia Scale, FABQ: Fear Avoidance Behavior Questionnaire, *Post Hoc Test (Bonferroni-Dunn's test), p value; statistical significance

Table 4. The correlation analysis of the parameters in Group 1 experiencing pain during menstruation

Variables		Duration of Menstrual Period	Frequency of Menstruation	Pain Intensity During Menstruation
TKS	r	0.637	-0.297	0.750
	*p	0.002*	0.204	<0.001*
FABQ	r	0.166	0.024	0.659
	*p	0.485	0.919	0.002*

TKS: Tampa Kinesiophobia Scale, FABQ: Fear Avoidance Behavior Questionnaire, r; Spearman rank correlation coefficient, p value; statistical significance, *p<0.05

In the study by Doğan et al. examining the coping approaches of Primary Dysmenorrhea (PD) patients with menstrual pain and the relationship between kinesiophobia and pain intensity, traditional methods were preferred more than exercise in PD and individuals with high pain intensity had more fear of movement (kinesiophobia), and relatively low rates of exercise showed that individuals avoided exercise due to pain [16]. In our study, similar to these results, kinesiophobia and fear avoidance behavior were higher in the group experiencing pain. In another study examining the factors affected by kinesiophobia in postmenopausal women with chronic low back pain, pain had an effect on functional disability, and the relationship between kinesiophobia and anxiety and between anxiety and functional disability were significant, and as a result, kinesiophobia affected pain intensity, functional disability, and anxiety [17]. Premenstrual symptoms and physical changes affect women throughout their reproductive lives; premenstrual symptoms and the luteal phase are interrelated, including headaches, cramps, irritability, decreased concentration, depression, and anxiety [18]. It is thought that symptoms such as thigh, abdominal, and low back pain, which frequently occur during menstrual pain, may cause avoidance of movement, and immobility may increase pain. It is stated that kinesiophobia usually occurs between the waist and neck region and as a result individuals avoid movement [10]. Svensson et al. reported that pain increased during menstruation in 51% of women with chronic low back pain [19]. Güçlü et al. evaluated the relationship between the fear avoidance attitudes and disability and quality of life in 105 patients with low back pain, and as a result, they reported that the level of movement phobia increased as the pain intensity increased, and when the pain intensity, anxiety, and depression level increased, physical function decreased [20]. Altuğ et al. examined the relationship between kinesiophobia and quality of life parameters in 112 patients with chronic low back pain, and reported that in the presence of kinesiophobia, quality of life was negatively correlated with general health, physical function, social function, and pain parameters [21]. A study using kinematic analysis showed that a specific lumbar movement was significantly slower in the chronic low back pain group with a high degree of kinesiophobia than in the group with a low degree of kinesiophobia [22]. This suggests that kinesiophobia may affect athletic performance in athletes, especially in sports that require speed.

The kinesiophobia model suggests that patients are afraid to move because of pain to avoid worsening their condition or causing a new problem. This fear leads to two responses: the patient can either confront the activity or avoid it. During confrontation, the individual does not avoid movement and the fear of this movement gradually decreases. In avoidance, the individual avoids movement and becomes less and less active, resulting in a vicious cycle leading to physical disability [23]. A systematic review by Suarez et al. found a significant association between increased kinesiophobia and high levels of pain intensity and disability, and a moderate association between increased kinesiophobia and high pain intensity and poor quality of life [24]. It is widely accepted that fear avoidance behavior causes the development of disability, and decreasing fear avoidance behavior shortens recovery time in patients with acute low back pain [25, 26]. Another complaint in patients with low back pain is functional disability, which reduces their ability to manage activities of daily living [27]. A study on the Chinese population has shown that menstruation may be accompanied by musculoskeletal disorders and low back pain [28]. Although the exact causes of menstrual low back pain (MLBP) are not yet fully understood, research suggests that MLBP is also influenced by hormonal factors [29].

As the pain increases, kinesiophobia and fear avoidance behavior increase, and as a result, individuals become more inactive, which causes inadequacies even in daily life activities. In case of repeated kinesiophobia, individuals face the risk of injury due to inactivity, and the recovery process is prolonged in cases such as low back pain. Our study examines kinesiophobia and fear avoidance behavior of female athletes and reveals that pain increases both kinesiophobia and fear avoidance behavior in parallel with the results of the studies we examined in the literature.

Conclusions

Study results have shown that a significant majority of female athletes experience pain during menstruation. Pain intensity during menstruation is associated with kinesiophobia and fear avoidance behavior that can be an obstacle for optimum training and performance. Developing ways of coping in the presence of menstrual pain can provide significant gains in approaching female athletes who exhibit kinesiophobia and fear avoidance behavior and in performing their performance at an optimum level or minimizing the performance losses they may experience. Raising awareness about this problem, which may be ignored by the families, coaches, clubs, and sports and health professionals that female athletes are in contact with, will contribute to the solution of the current problem of the athletes.

Highlights

A significant majority of female athletes experience pain during menstruation and exhibit kinesiophobia and fear avoidance behavior due to

pain.

Pain intensity is associated with kinesiophobia and fear avoidance behaviour in female athletes during menstruation.

Developing ways of coping in the presence of menstrual pain can provide significant gains in approaching female athletes who exhibit kinesiophobia and fear avoidance behavior and in performing their performance at an optimum level or minimizing the performance losses they may experience.

Limitations

While the study measured fear avoidance behavior and kinesiophobia experience of female athletes during menstruation, it did not examine the psychosomatic characteristics of the women. This is the most important limitation of our study. Another limitation of the study is that it was conducted on a relatively small sample. In future studies, studies involving female athletes from different branches in larger groups, examining the psychosomatic characteristics of athletes will contribute to the literature.

Acknowledgments

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Investigation of social capital, empathy and individual responsibility parameters in dual career athletes: an exploratory study

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Abstract

Background and Study Aim	The main purpose of the study is to investigate whether the individual responsibility and empathy levels of athlete-students affect the level of social capital. The secondary purpose is to examine the social capital, empathy and individual responsibility levels of athlete-students in terms of various variables and to reveal the relationship between them.
Material and Methods	In this context, "Social Capital Scale" , "Empathy Scale in Sports Environment" and "Student Individual Responsibility Scale" were used as data collection tools. University students participating in sports competitions in the 2021-2022 academic year were included in the study on a voluntary basis. The inclusion criteria were determined as being both an athlete and a student, being over the age of 18 and being a competitor. A total of 284 (N female=110; N male=174) athlete-students who met these criteria participated in the study. Since the normal distribution conditions were met in the analysis of the data, independent t-test was used for pairwise comparisons, one-way anova for multiple comparisons, and pearson correlation test for relationship analysis. After the assumptions were met, linear regression test was used to determine the effect levels.
Results	As a result of the study, all dependent variables were high in favour of men, and the variables were positively affected as age and years of experience increased. In addition, a positive and moderate relationship was found between the dependent variables. As the main result of the study, the effect rate was determined as 39% by the regression analysis conducted to evaluate empathy and individual responsibility as predictors of social capital.
Conclusions	As a result, the concept of social capital, which expresses the continuity and sustainability of our life-related social relations, seriously affects the levels of empathy and social responsibility in the sample of athlete-students in the sports environment. It is thought that the studies to be carried out for the development of these skills will positively affect the concepts of safety, social communication and fair-play in sports.
Keywords:	individual responsibility, dual career, empathy, social capital

Introduction

With the developing technology and globalizing world opportunities, the 22nd century is perhaps the most fortunate period of human history in terms of communication. Although the effect of communication opportunities between individuals is quite high at the level of social communication, an important factor affecting communication is the ability to empathise. Empathy, which is simply defined as being able to put oneself in someone else's shoes, is a concept that cannot be ignored in the formation and maintenance of the idea of individual responsibility in social life and sportive competitions that have significant effects on the socialisation process [1]. The individual with individual responsibility is in a cycle that differs according to the family, friendship relations and environmental factors, which affects the individual to gain or lose social prestige through the behaviours he/she exhibits. Although individual responsibility affects the individual at every point of life, it shows its

most important distinguishing role in environments where social unity is experienced at the highest level. Sports competitions or events are among the important places where the aforementioned social unity is experienced and accordingly, interpersonal social capital is realised [2]. Social capital, empathy and individual responsibility play a complementary role by contributing to the trust between individuals, relationships and the achievement of the goals that bring individuals together. It is a phenomenon that develops trust, mutual understanding and common values and behaviors that connect human networks and groups and enable cooperation through active social connections between people [3]. It will require time and expertise to realise a goal, to achieve it and to gain momentum for success both in academic life and in sports competitions. When all these are realised, the career will be formed.

The concept of career is used in daily language for progress, profession, business life, experiences related to success [4]. Career is "the stage, success and expertise achieved through time and work in a profession" [5]. Career also refers to all the

ways and methods that individuals follow upward throughout their working lives. These ways and methods are visual or written resources on professional development, training, rotation, career counsellors, life coaches, professional and personal development, etc. [6]. The concept of dual career, which means having two careers at the same time or having a title and status in both occupations at the same time, often refers to athletes who try to maintain their professional or academic education together with their sports careers [7]. If a person has two different jobs and these jobs provide him/her with different status, title, prestige and career, he/she should have the expertise, knowledge, skills and abilities required by both jobs. If not, he/she has to improve himself/herself in these subjects. This process is called dual career. However, it is inevitable for people to experience problems while progressing in these two careers. While trying to develop his/her career for both jobs, the person may experience problems when he/she does not use his/her energy in a balanced way. Sometimes one of the two jobs makes the person happier. In this case, the person may neglect the other job [6].

Many athletes continue their sporting careers together with education or occupation. This process starts with the participation of the athletes in compulsory education and continues with the inclusion of the majority of them in higher education or professional employment in the following period [8]. An athlete must be in an intense competition and training program in order to achieve a high level of success in the sports branch s/he is doing. In this intense pace, the athlete is also expected to continue his/her academic education. In these cases, special regulations may be needed for elite and talented athletes to avoid the necessity of choosing sports or education [9]. Although the successful regulations of a global society cannot be implemented in other countries, it is extremely important to examine the history of various education systems [10].

However, the flexibility in terms of expenditure and the role of the workplace as a tool for self-development and socialising with friends are among the advantages of dual careers, especially for students who have difficulty in meeting the increasing financial resources [11]. Thus, having a dual career will increase the status of the students in society, the quality of their living standards and their income, which is one of the biggest advantages of individuals with dual careers. Individuals who have better financial opportunities will experience psychological relief, and accordingly, their social capital, empathy and individual responsibility levels will differ from other individuals.

Material and Methods

The research is a study in relational survey model to examine how much perceived empathy and social responsibility perception variables predict social capital levels in athlete university students. The ethical procedure of the study was supported by Selcuk University Non-Interventional Clinical Research Ethics Committee with the decision dated 09.11.2022 and numbered E-40990478-050.99-403334.

Participants

The universe of the research consists of students studying university and participate to sports competition in Turkey in the 2021-2022 academic year. The sample group of the study consisted of 284 (Nwoman=110; Nman=174) students from faculty of sport science who were selected by convenience sampling method, studied at the central campus of Selçuk University, regularly participated in mobile games, and participated in the study voluntarily. The criteria for inclusion in the study are to have been student and athlete same time and above the 18 years. For this purpose, it was questioned in athletes branches, age and experiences at sports in the study.

Research Design

The data collection process was collected in the units located on the main campus, fieldhouse during or outside the lessons and after training. Individuals participating in one branches amateur or professionally were given preliminary information about the study, they were promised that their personal information would be protected, and the scale was applied on a voluntary basis. It took 7-10 minutes per person to complete the scale.

Instruments

Social Capital Scale

Scale developed by Onxy and Bullen [12] and adapted to Turkish by Ardahan [13]. was used to determine the social capital perceptions of athlete students. The scale is based on self-report and consists of 28 items. The scale has 9 dimensions which are participation in local committee, neighbourhood relation, sense of belonging, tolerance for differences, Nongovernmental Organization (NGO) Membership, trust in people, safe environment, initiative in social issues and social representation. The statements in the scale are definitely rated as absolutely yes (4), often yes (3), often no (2) and absolutely no (1). High scores obtained from the scale indicate that the perception of social capital is high. The validity of the Turkish form of the scale was examined by exploratory factor analysis. The factor loading of the scale items ranged from 0.58 to 0.89. The alpha coefficient calculated for the overall scale was 0.71 [13].

Empathy Scale in the Sports Situations (ESSS)

Empathy Scale in the Sports Situations (ESSS) developed by Erkuş and Yakupoğlu [14] was used in

order to measure empathy level of athletes in the sportive situation. It is a four point Likert type scale. The scale is consisted of 16 items under emotional empathy (5 items) and cognitive empathy (11 items) [14]. In this study; internal consistency coefficients of the ESSS are .951 were found to be within acceptable range in this study.

Individual Responsibility of Student Scale

The scale developed by Singg and Ader in [15], was adapted to Turkish by Doğan [16]. It consists of 10 items. In the measurement tool, there are options for variable 4-point Likert grading between "same me" and "not related to me" for each item. In the study, the Cronbach Alpha internal consistency coefficient was found to be .70.

Statistical Analysis

In the analysis of the data, descriptive statistical methods frequency (n), percentage (%), arithmetic mean (X) and standard deviation (SD) were used for personal information. In the study, first of all, the normality and linearity of the data sets were evaluated to determine whether the data were suitable for simple linear regression analysis and chosen which variance analyses had been to. The existence of extreme values that make normality (multivariate) and linearity assumptions difficult was examined according to mahala Nobis distance (8.02) and cook's (Cook'<1) values. In addition, the kurtosis, skewness values, scatter and histogram graphs of the data sets were also examined. In addition to meeting the linearity and normality conditions of the data sets, it was seen that the sample size was sufficient considering the number of predicting variables. For the condition that there is no high correlation coefficient between the predictor variables, which is another assumption of the simple linear regression analysis, the binary correlation coefficients between the predictor variables, VIF and CI values were examined.

It was determined that there was no correlation value above .80, which can be defined as multicollinearity among the predictive variables, the VIF value was less than 10 and the CI value was less than 30. Finally, the Durbin-Watson value was checked to examine the condition of errors being independent; It has been seen that the value is between 1-3 (DW=1.29) and does not pose a problem. It has been determined that the data obtained depending on these processes are suitable for simple linear regression analysis. The data obtained in the research were analyzed using the simple linear regression analysis method and the inter regression analysis method. .05 significance level was taken as basis in the research [17, 18].

Results

In this section, the characteristics of athlete university students (Table 1), the relationships

between the predicted variable (Social Capital) and the predictor variables (Empathy and Personnel Responsibility) were examined (Table 3). Then, from simple linear regression analysis, inter regression analysis was performed and the results are given in Table 4. In addition, investigated to scales with demographic variables (Table 2).

Table 1. Participant Characteristics of athlete university students

Variables	Category	N	%
Branches	Taekwondo	182	64.1
	Wrestling	102	35.9
Gender	Women	110	38,7
	Men	174	61,3
Experience (Year)	1-3 years	83	29,2
	4-6 years	42	14,8
	7-9 years	66	23,2
	10 years	93	32,7
Age	<20 age	130	45,8
	21-23 age	128	45,1
	24 age and above	26	9,2
	Total	284	100,0

According to table 2, social capital and empathy levels are statistically significant in favor of female athletes-students by gender. Socail capital, empathy and personnel responsibility levels statistically significant in favor of under 20 age and empathy and personnel responsibility levels statistically significant in to the detriment of who had experience 7-9 years in sport.

When Table 1 is examined, it is seen that there are moderately positive and significant relationships between the total scores of social capital, empathy and personnel responsibility of student scales.

Examining the ANOVA table, which tests the relationship between the predictor variables and the predicted variable and therefore the significance of the degree of explaining the change in the predicted variable, it was found that the explained variance or the regression model was statistically significant ($F_{2/281}$=89.648; p<0.001). Accordingly, the predictor variables successfully performed the prediction process on the model.

When Table 4 is examined, it has been determined that empathy and personnel responsibility variables are treated in the inter regression analysis process, since the regression analysis significantly predicts social capital. When both beta values and partial and binary correlation coefficients (Table 3) were examined, it was determined that there were positive and significant correlations between social capital, empathy and personnel responsibility variables. Perceived personnel responsibility and empathy variables together explain approximately

Table 2. Comparisons of Social capital scale, empathy scale and individual responsibility scale according to demographic variables

Parameters	Social Capital	Empathy	Personnel Responsibility
Female	79,70±15,26	51,57±6,90	26,09±5,97
Male	72,61±18,80	47,18±13,15	25,98±6,37
t/ES	**3.320**/0.40**	**3.227**/0.39**	0.135/0.01
<20 age	80,05±15,61[a]	50,88±6,99[a]	27,11±5,88[a]
21-23 age	71,32±19,92[b]	45,92±14,50[b]	24,67±6,46[b]
>24 age	71,73±10,49[b]	53,46±7,00[a]	27,23±5,35
F/ES	**8,778**/0.05**	**8,974**/0.06**	**5,679**/0.03**
1-3 years	75,36±15,81	49,98±7,45[a]	27,45±6,03[a]
4-6 years	75,30±13,44	50,45±7,71[a]	27,69±5,23[a]
7-9 years	70,92±26,54	41,96±17,91[b]	21,09±5,74[b]
>10 years	78,52±12,32	52,09±6,80[a]	27,50±5,27[a]
F/ES	2.375/0.02	**12,549**/0.11**	**22,205**/0.19**

*$p<0.05$; **$p<0.01$; L: Lower; U: Upper; t: Independent sample t test value; F: One-way anova test value; Post-Hoc: were used Scheffe test in this study (a: higher, b: lower), ES: Effect Size (cohen's d for t test and f for Anova)

Table 3. Relationships Of Social Capital, Empathy and Personnel Responsibility Scales

Scales and Sub-dimensions		1	2	3
Social Capital	r	1	0.610**	0.396**
	p		0.000	0.000
Empathy	r	0.610**	1	0.459**
	p	0.000		0.000
Personnel Responsibility	r	0.396**	0.459**	1
	p	0.000	0.000	

**$p<0.01$

Table 4. Simple linear regression analysis showing predictive power of independent variables

Model B		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	R	R²	Adjusted R²
		Std. Error	Beta	Beta					
1	(Constant)	220.721	4.217		50.388	0.000			
	Empathy	0.854	0.082	0.543	100.357	0.000	0.624[a]	0.390	0.385
	Personnel Responsibility	0.419	0.151	0.146	20.784	0.006			

39% of the total variance in social capital in athlete university students (R=.624; R²=.390; P<.01).

Discussion

Sports and competitions serve as a showcase in many countries. The promotion of culture made in this way is important in breaking global prejudices, developing strong empathy and clarifying international tolerance. Because the phenomenon of peace, on which the Olympic philosophy is based, is most visible in sports environments. Considering all this network of relationships, it is necessary to investigate the concepts that need to be developed and affect each other in the environments where most of the student-athletes, from among the dual-career athlete groups that can be considered as a special group, are candidates to represent their country or are currently representing their country.

The aim of our study is to examine the concepts of social capital, empathy and individual responsibility according to the basic variables and to reveal the relationship between them. The study also aims to investigate the effects of empathy and individual responsibility concepts as predictors of social capital in dual-career athletes.

As a result of our study, significant results were

obtained in favor of female participants in the social capital and empathy scales by gender, in favor of athletes aged 20 and under in all scales by age, and in favor of participants with low years of experience in empathy and responsibility scales by experience.

In their study on empathy, Ozturk et al. [19], Toussaint and Webb [20], Dorak and Vurgun [21] found that female participants had higher levels of empathy than males. Ekinci [22] and Gürocak [23] concluded that the results of the test they conducted to determine whether the social capital levels of the participants changed according to gender were significant in favor of female participants. Akgün Şahin and Kardaş Özdemir [24] indicated that as the age of the participants increased, their empathy skills increased and it was statistically significant. Barsbuga et al. [2], Inan [25] and Arı [3] found a highly significant difference between the participants in the low age group compared to the participants in the high age group. In other words, they concluded that younger age groups have higher social capital levels. In the studies conducted by Tapşın and Karagün [26] and Toprak [27], it was determined that younger students had a higher sense of individual responsibility than older students. It can be said that this difference between empathy perceptions in the literature and our study is due to the presence of many factors (such as time/success/academic/educational issues) that may be more effective than the age group in the university and sports environment. In the study conducted by Akgün Şahin and Kardaş Özdemir [24], it was concluded that as the experience of the participants increased, their empathy skills decreased and it was statistically significant. In their study on individual responsibility levels, Barsbuga et al. [1] did not find a statistically significant difference between the participants according to the experience variable. Considering these results, it is thought that high levels of empathy and individual responsibility of dual career individuals who are new in terms of experience compared to individuals with more experience are due to their high sense of achievement and self-affirmation. In the study, the results in consistent with the literature were obtained by evaluating the scales applied with the demographic variables. The results contradicting the literature can be attributed to the fact that the research group is dual-career athletes, who only exist in individual competitive sports, and their age groups, habits and terms are similar [28]; [29].

In the findings constituting the exploratory part of our study, moderate positive relationships were found between social capital, individual responsibility and empathy scales. The existence of this relationship reveals the possibility that these phenomena may affect each other [30]. In this study conducted on dual career athletes, it is investigated whether empathy and individual responsibility affect the concept of social capital. As a result of the study, it was concluded that these two phenomena affect social capital by 39%.

Empathy, individual responsibility and social capital, as three different concepts and behavior regulation factors, are the elements that will facilitate the life of the individual, and affect the attitudes towards life, such as communication skills, self-confidence, punctuality, tolerance and so on [31, 32]. However, social capital, which is one of the capital types defined by the literature, which characterize social life and ensures its continuation with harmony, includes the elements of empathy and responsibility [33, 34]. It is argued that empathy and responsibility, which are of high importance in the sports environment, are a necessity in the success-oriented work of competitive athletes [35]. The athlete-student group that constitutes our sample also tries to exist in an ongoing social environment. In a dual career, one's involvement in sports requires an absolute social skill to sustain the other career. In this context, it can be said that social capital patterns of this group develop and individual responsibility and empathy levels should be higher than individuals who are only athletes or only students [36, 37].

In the sports environment, the components of empathy, individual responsibility and social capital can be seen separately. Athletes and members of the sports environment come to the fore with their sensitivity towards their environment while performing their duties within certain rules [38]. On the other hand, it is predicted that the athlete who is far from this sensitivity has a very high probability of displaying anti-fair play behavior in the sports environment [39]. The athlete gains permanence with the rule that s/he is aware of her/his own situation and can act in accordance with it [40]; [41]. The basic element of success is the sense of responsibility in sports competitions where irresponsibility becomes evident most quickly and directly affects success. This encourages the individual to examine and internalise both his/her responsibility towards himself/herself and the environment [42]. This brings up the concept of empathy. Empathy in the sports environment has many factors such as coach, team, opponent, audience, field, environment, etc. The athlete who acts with the awareness of all factors is expected to anticipate foreseeable outcomes and to determine the focus of success thanks to his/her empathic side [43, 44]. Empathy fuelled by individual responsibility enables us to see the elements of social capital in the sports environment as the expression of the relationship between them [13]. Independent from the sports environment, the efforts of dual career athlete-students, who constitute our research group, to realise themselves in more than one environment is a situation that directly or indirectly affects these

concepts. It is important to manage and direct social situations such as social environment, tolerance to difference [45], representation, belonging and tolerance, which are among the components of social capital, in the sports environment. Athletes tend to rely on the relationship of coming together as a team. This sense of trust will increase the success of the team or individual and feed each other. In addition, since athletes from different cultures within the team will have the opportunity to better understand their surroundings and benefit from different perspectives, and the source of empathy will feed the social capital elements [46]. It is thought that the prediction rate of 39% obtained from the study is a serious level of influence as a result of the fact that the competitive students in the sports environment are involved in more than one area of responsibility [47].

Conclusions

As a result of our study, the relationship between the concepts of individual responsibility, empathy and social capital has been revealed. It has been concluded that these three phenomena that support social status and behaviors have a high power of influencing each other in the perceptions of students in the sports environment. It can be said that the fact that individuals are in more than one social environment in the context of being a student and an athlete feeds similar perceptions that develop the perspective of socialization and sensitivity. Future researchers can apply this study and similar studies on team athletes and individuals participating in recreational activities. Determining the differences between individual and team athletes and revealing the extension of the athlete-other sector employee from the athlete-student context will enrich the literature. Based on the results of the study, it is also recommended to compare the dual-career and single-career samples, to determine the situation and, if necessary, to carry out supportive studies.

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Conflict of Interest

The authors declare no conflict of interest.

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