IJDSHS
INTERNATIONAL JOURNAL OF DISABILITIES SPORTS & HEALTH SCIENCES
Volume: 7 Issue: 3 May 2024

e-ISSN 2645-9094 TURKEY

Volume:7 Issue:2 March 2024

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

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Volume:7 Issue:2 March 2024

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

ADVİSORY BOARD

Volume:7 Issue:2 March 2024

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

International Journal of Disabilities Sports and Health Sciences (IJDSHS) is an international scientific peer-reviewed journal, published Biannually in electronic format. The articles in this journal are published OPEN ACCESS (OA) exclusively in English International Journal of Disabilities Sports and Health Sciences has been indexed in **SCOPUS and EBSCOhost™ and in HW Wilson Education Fulltext.** Detailed information on preparation of the manuscript is described in the Instruction for Authors. Ethical Committee Approval in Research: "ETHICAL COMMITTEE APPROVAL" must have been obtained for all disciplines, this approval must be specified and documented in the article.

• "**iThenticate**" document is mandatory for article submission (Maximum15%).

Editor-in-Chief : Assoc Prof. Nevzat DEMİRCİ

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PUBLICATION FREQUENCY

IJDSHS will be published in 6 issues (January, March, May, July, September and November) from 2024

CORRESPONDENCE ADDRESS

Journal Contact: ijdshs@gmail.com

Editor: ijdshs.editor@gmail.com

Volume:7 Issue:2 March 2024

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

INDEX COVERAGE

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Volume:7 Issue:2 March 2024

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

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International Journal of
Disabilities Sports and Health Sciences
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RESEARCH ARTICLE

Effects of Auricular Vagus Nerve Stimulation on Cardio-Respiratory Functions After Aerobic Exercise

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Abstract
The aim of our study is to find out whether the return rate of parasympathetic activity (PA) can be accelerated with auricular transcutaneous vagus nerve stimulation (TVNS). Pulmonary function test, ANS activity, pulse and blood pressure measurements were made. Individuals ran for 15 minutes. Those in the TVNS group received 5 minutes of auricular VNS. In the control group, headphones were attached but no current was given. After the end of their procedures, they were compared with pre-exercise. In the TVNS group, the pulse parameter was higher than in the initial measurement ($p=0.001$). There was a significant ($p=0.007$) rise in the FEV1 value in the VNS group. The sympathetic nervous system (SNS) index ($p<0.05$) increased in both groups when compared to the initial measurement, although there was no significant difference in the index values between the groups. The TVNS group showed an increase from the first measurement ($p<0.05$), but there was no significant difference in the parasympathetic nervous system (PNS) Index between the groups ($p>0.05$). The groups' values for the first and second measures were equal ($p>0.05$), and the root mean square of the successive differences (RMSSD) values did not reveal a significant difference. TVNS can improve respiratory parameters in healthy individuals in the acute period after exercise, and it seems that it can also increase activation in both the sympathetic and parasympathetic system. It can be stated that TVNS may lead to variable results in different circumstances in sports

Keywords
Vagus Nerve, Stimulation, Respiratory Function, Exercise Recovery

INTRODUCTION

The autonomic nervous system is comprised of the parasympathetic and sympathetic nervous systems (ANS). The parasympathetic and sympathetic nerve systems in the body normally play opposing roles, with the activity of one system increasing and the other decreasing as needed. After engaging in physical activity, such as exercise, the body's sympathetic nervous system rises and eventually achieves a maximal activity plateau. After physical exertion, parasympathetic activity which was inhibited throughout the activity—begins to rise, and eventually the brain returns to resting state (Coote, 2010). According to Chen et al. , the primary factor influencing reorganization and recovery (restoration) following exercise is parasympathetic capability (Chen et al. 2011). It is well established that endurance training improves parasympathetic regulation both before and after running (Boullosa et al., 2009). When post-exercise alterations return to baseline levels, recovery from exercise has taken place.

The vagus nerve is widely distributed throughout the body, making cervical invasive vagus nerve stimulation (VNS), an approved technique for treating depression and epilepsy

Received: 22 December 2023 ; **Revised** ; 04 March 2024 ; **Accepted:** 02 May 2024; **Published:** 25 May 2024

How to cite this article: Güçlüer, A.O., Özden, A.V., Ural, H.İ., Alptekin, H.K., and Hatik, S.H. (2024). Effects of Auricular Vagus Nerve Stimulation on Cardio-Respiratory Functions After Aerobic Exercise. *Int J Disabil Sports Health Sci*;7(3):494-501. https://doi.org/10.33438/ijdshs.1406505

since 2005, nonetheless interesting for a variety of physiological and pathological disorders. According to Mullers et al., VNS can influence cardiovascular parameters during activity as well as at rest (Mulders et al., 2015). Auricular TVNS has the ability to lower sympathetic activity, according to Clancy et al. (Clancy et al., 2014). Furthermore, as reported by Antonino et al., transcutaneous VNS enhances autonomic regulation and heart baroreflex sensitivity (Antonino et al., 2017).

Due to their negative effects on exercise performance and increased risk of injury, post-exercise weariness and delayed recovery are important. With appropriate exercise routines, one can eventually raise parasympathetic activity following exercise (Gifford et al., 2018). When assessed abruptly, parasympathetic reactivation and the decline in sympathetic activity following exercise slow down with increasing exercise intensity (Michael et al., 2017; Michael et al., 2018; Ebersole et al., 2020). Recovery from exercise can be accelerated and improved by ANS modulation. The auricular vagus nerve can be electrically stimulated to boost parasympathetic activity following exercise, which could aid in recuperation. Our study aimed to evaluate the recovery status through pulse, blood pressure, respiratory functions and ANS activity after exercise and whether this recovery can be achieved faster with auricular TVNS.

MATERIALS AND METHODS

Study Design and Participants

Forty healthy male individuals between the ages of 18-40 were included in the study. Those who had any disease (Those with cardiovascular diseases, autoimmune diseases, musculoskeletal disorders, psychiatric and neurological disorders, and those taking medication for any reason) and pain, who were on medication, who had tachycardia (>90/min) and hypertension (diastolic>90 or systolic>140 mm Hg) were excluded from the study. This study was carried out in the Physiotherapy and Rehabilitation Unit of Istanbul Fatih Medicalpark Hospital. Age, weight and height of the individuals included in the study were evaluated. First, the measurements were made within the scope of the study. Pulmonary function test was performed with a spirometer (spirolab-III). An Omron M2 basic electronic device was used to measure the subject's heart rate and blood pressure on the left arm. To gauge ANS activity, the individuals' heart rate variability (HRV) was monitored for five minutes. The investigations were conducted using the eMotionFaros 180 equipment with Kubios standard software.

After these procedures, the participants were made to run for 15 minutes (at a speed of 70% of the maximum heart rate) on the treadmill (Figure-1). Maximum heart rate was determined to be 220-age. The participants rested for 5 minutes at the end of the run. After the rest, TVNS was applied from both ears for 5 minutes to those in the experimental group, while those in the control group wore earbuds for 5 minutes, but no stimulation was applied. HRV measurement was performed during VNS, the other measurements were repeated after VNS.

Spirometry is a simple test used to measure static lung volumes at rest - slow vital capacity (sVC), forced vital capacity (FVC) - and dynamic volumes - forced expiratory volume in 1 second (FEV1), flow-volume loops. Spirometry provides clinically relevant parameters of the patient's functional status. The highly reproducible acquisition of these lung function parameters, together with the caveat mentioned above, are advantages of spirometry and are particularly valuable in serial measurements (Behr et al., 2008).

Pulmonary function testing is used for lung function measurements. In the study, a spirolab-III spirometer was used for pulmonary function testing. A separate mouthpiece was used for each individual and three measurements were made and the highest value was recorded on the participant follow-up form.

Heart rate variability (HRV) analysis is often used in cardiovascular research and to evaluate the functioning of the autonomic nervous system (ANS). HRV is a result of the influence of the sinoatrial (SA) node on the ANS. Sympathetic activity tends to increase HR and decrease HRV, while parasympathetic activity tends to decrease HR and increase HRV. Kubios HRV is another software program used for heart rate variability (HRV) analysis. The software supports electrocardiogram (ECG) and beat-to-beat RR interval data. It calculates HRV parameters and various nonlinear parameters in the entire time domain and frequency domain. The ECG-derived

respiratory frequency is also calculated; This makes the analysis results reliable **(**Tarvainen et al., 2014).

In the study, E-motion Faros 180 was used for autonomic measurement. Kubios software was used to analyze the obtained SNS index, PNS index, RMSSD and stress index data.

Intervention

VNS: Stimulation was performed for 5 minutes using the Vagustim device (Figure 2), from the tragus and concha sites of both ears. Current characteristics were set biphasically with a pulse width of 100 is and a frequency of 10 Hz (Hatık et al., 2023).

Evaluation Criteria

The ANS was evaluated using the values of the SNS index for sympathetic activity and the RMSSD (Root mean square of the successive differences) and PNS index for parasympathetic activity.

The pulmonary function test uses two measures: forced expiratory volume in one second (FEV1) and forced vital capacity (FVC). The maximum value of the three measurements was recorded using a mouthpiece specific to each individual in the spirometer. Blood pressure and heart rate: measured in millimeter-hours (mmHg) for both the diastolic and systolic pressures.

Randomization

The study was randomized by having the participants draw numbers from a sealed envelope containing even and odd numbers. A total of 40 individuals were included in the study, 20 in the control group in which ear electrodes were placed but no current was applied, and 20 in the TVNS group.

Statistical Analysis

After being recorded using the measurements, the data was loaded into a computer and examined using SPSS 20.0 (SPSS Inc., Chicago, IL). The two groups' differences were evaluated using the Independent Samples T-test and Mann-Whitney U Test; the dependent groups' differences were evaluated using the Dependent Sample T-test and Wilcoxon Rank Test. A normality test and frequency analysis were used to determine the demographic traits. A significance level of $p<0.05$ was established for the study.

Permission

The study was planned in compliance with the Declaration of Helsinki's principles. The study was approved by the Istanbul Yeni Yuzyil University Clinical Research Ethics Committee on November 14, 2019, with decision number 14.11.2019/27.

RESULTS

The study included forty healthy participants: twenty in the TVNS group and twenty in the control group. The control group's mean age was 27.40, while the TVNS group's was 23.45. The control group's mean age was considerably greater ($p=0.024$). Height, weight, and body mass index did not significantly differ between the groups ($p>0.05$). (Table 1).

When the first and second heart rate measurements of the participants were compared, the TVNS group showed a significant rise ($p=0.001$), whereas the control group did not ($p=0.059$). TVNS group showed a statistically significant increase ($p=0.007$) in the mean scores of the first and second FEV1 measures when compared to the control group, which showed no significant difference ($p=0.102$). The TVNS group showed a substantial rise ($p=0.001$) in the mean scores of the first and second FVC measures, while the control group showed no significant difference ($p=0.366$). Both groups' first and second systole measures showed a substantial decline ($p=0.001$ and $p=0.001$). There was no discernible difference between the groups when the diastole values from the first and second measurements were compared (TVNS group $p=0.194$, control group $p=0.108$). A substantial rise was discovered when the first and second SNS index measurements' mean scores in the two groups were compared (TVNS group $p=0.002$, control group $p=0.006$). The first and second measurement values of the PNS index were found to be identical in the control group ($p=0.083$), although the PNS index value was found to be greater in the TVNS group in the second measurement ($p=0.010$). In both groups, there was no discernible difference in the mean score from the first and second RMSSD measurements (TVNS group $p=0.100$, control group $p=0.467$). (Table 2).

In the first and second measurement, it was noted that the pulse, FEV1, FVC, systole, diastole, SNS index, PNS index, and RMSSD values were comparable between the TVNS and control groups. ($p>0.05$) (Table 3).

Table 1. Intra-group comparison

	TVNS group (n=20)				Control group (n=20)			
	First Measurement Mean±SD / Median	Second Measurement Mean±SD / Median (Min-Max)	U/Z/T TEST	P	First Measurement Mean±SD / Median (Min-Max)	Second Measurement Mean±SD / Median (Min-Max)	U/Z/T TEST	P
Pulse	76,95±13,39	85,55±11,794	-6,212	0,000[a]	82,65±14,321	86,30±10,598	-2,012	0,059
FEV1	3,13±0,768	3,40±0,746	-3,029	0,007[a]	3,12±0,905	3,32±0,794	-1,717	0,102
FVC	3,31± 0,786	3,70±0,787	-3,965	0,001[a]	3,51±0,840	3,63±0,800	-,926	0,366
Systole	125,00±10,6	114,50±10,26	5,532	0,000[a]	120,35±14,88	109,05±10,01	4,746	0,000
Diastole	70,85±8,658	68,05 ±8,035	1,347	0,194[a]	72,10±8,705	69,90±8,789	1,688	0,108
SNS index	1,07±1,684	2,15±1,479	-3,483	0,002[a]	1.496/0.805 (-1,18/5,4)	1.267/1,705 (-1,14/4,24)	-2,722	0,006[d]
PNS index	2.016/-0,855 (-2,28/6,49)	0.914/-1.77 (-2.97/-0.03)	-2,576	0,010[d]	1.617/-0,425 (-2,75/3,76)	1.267/1.705 (-1.14/4,24)	-1,736	0,083[d]
RMSSD	47.915/36.8 (11,6/231,4)	18.626/26.9 (10.5/75,4)	-1,643	0,100[d]	39.924/46,7 (8,3/165,8)	43.778/34,8 (13,9/187,1)	-0,728	0,467[d]

[a]Paired Samples T-test / [b]Independent Samples T-test / [c]Mann Whitney U / [d]Wilcoxon Rank

Table 2. Comparison between groups

	First Measurement				Second Measurement			
Parameters	**TVNS Group (n=20) Mean±SD / Median (Min/Max)**	**Control Group (n=20) Mean±SD / Median (Min/Max)**	**U/Z/T TEST**	**P**	**TVNS Group (n=20) Mean±SD / Median (Min-Max)**	**Control Group (n=20) Mean±SD / Median (MinMax)**	**U/Z/T TEST**	**p**
Pulse	13.39/71 (55/112)	14.32/80.50 (61/113)	151,50	0,189[C]	85,55±11,794	86,30±10,598	-0,212	0,834[b]
FEV1	3,130±0,768	3,127±0,905	0,013	0,990[b]	3,405±0,746	3,327±0,794	0,322	0,749[b]
FVC	3,318±0,786	3,519±0,840	-0,781	0,440[b]	3,708 ±0,787	3,636±0,800	0,285	0,777[b]
Systole	125±10,603	120,35±14,88	1,138	0,262[b]	114,50±10,26	109,05±10,0	1,699	0,097[b]
Diastole	70,85±8,658	72,10±8,705	-0,455	0,651[b]	68,05±8,035	69,90±8,789	-0,695	0,491[b]
SNS	1.684/0.77 (-2,29/4,48)	1.496/0.805 (-1,18/5,4)	192,00	0,829[c]	2,15±1,479	1,83±1,267	0,473	0,315[b]
PNS	2.017/-0.855 (-2,82/6,49)	1.6171/-0.425 (-2.75/3,76)	168,00	0,387[c]	0.914/1,77 (-2,97/-0,03)	1.641/-1.295 (-2,97/4,16)	166,00	0,358[c]
RMSSD	47.915/36,8 (11,6/231,4)	39.924/46,7 (8,3/165,8)	176,50	0,529[c]	18.6270/26,9 (10,5/75,4)	43.779/34,8 (13,9/187,1)	165,00	0,344[c]

[a]Paired Samples T-test / bIndependent Samples T-test / cMann Whitney U / dWilcoxon Rank

Table 3. Demographic characteristics of the participants

	Mean±SD		T TEST	df	P
	TVNS Group	Control Group			
Age (Years)	23.45±5.094	27.40±5.529	-2.350	38	0.024[b]
Height (m)	1.791± 0.056	1.772±0.059	1.036	38	0.307[b]
Body weight (kg)	73.65± 9.885	77.05±11.124	-1.022	38	0.313[b]
Body mass index (kg/m^2)	22.945±2.926	24.518±3.221	-1.616	38	0.114[b]

[b]Independent Samples T-test

DISCUSSION

Our study found that there may be acute changes in physiological parameters such as pulse, respiratory capacity and HRV with auricular VNS after exercise. ANS enables these vital functions to be regulated with the activities of sympathetic and parasympathetic sub¬branches that complement and balance each other. The balance between the sympathetic system, which is active during stress, and the parasympathetic system, which becomes evident at rest, leads to homeostasis (Ozden, 2023). Being the most important part of PNS, the vagus nerve can be stimulated noninvasively from the auricular branch, or invasively or noninvasively from the cervical branch. VNS is a new method that can be used in the treatment of disorders associated with ANS dysfunction by leading to functional changes in the brain and ANS (Yuan et al., 2016; Busch et al., 2013). There are studies showing that VNS improves functional status after trauma or injury. In one study, it was observed that median and ulnar nerve transection and repair resulted in significant and long-term recovery of somatosensory function (Darrow et al., 2021). We preferred auricular TVNS in the study because it is noninvasive and easy to apply, and we aimed to examine the physiological effects of this technique, which has attracted more attention in recent years, in healthy male individuals aged 18-40 years after exercise. We did not include healthy female individuals in our study, considering that menstruation may affect ANS.

It is known that aerobic exercises are effective on cardiovascular, metabolic, psychological and respiratory adaptations. ANS function decreases in parallel with diseases, aging and decrease in exercise capacity (Machhada et al., 2017). Dominance of sympathetic activity increases with aging and accordingly, the risk of developing heart diseases increases. This demonstrates that cardiovascular parameters change with aging. PS increases and SA decreases with VNS, resulting in positive effects on cardiovascular parameters (Deuchars et al., 2018). Buchheit et al. (2007) revealed that sympathetic activity increases during aerobic exercise and the activation of the parasympathetic system continues for 24 hours or more after exercise, depending on exercise intensity (Buchheit at al., 2007). In another study, Stanley et al. (2013) stated that parasympathetic restoration is achieved in the first 1 hour after physical activity, and that performance is low in individuals with high sympathetic activity. In our study, we made the participants do aerobic exercise by running and increased sympathetic activity as the body's physiological response (Stanley et al., 2013). In a study on the effects of a single session of vagus nerve stimulation on sports performance in elite athletes, including 60 people in the control group, it was concluded that although there was no statistically significant improvement in athletic performance, it showed a moderate benefit (Çalı et al., 2023). One of the parameters used to evaluate cardiovascular functions is pulse. Metabolism and cardiac output increase depending on the increase in oxygen used in skeletal muscle with aerobic exercise. The increase in this output during exercise increases pulse (Wang et al., 2018). Our participants were standardized by being made to run until reaching seventy percent of their maximum heart rate (220-years) and then rested for 5 minutes. Although there was no difference between the groups in the measurements in the study, the heart rate values increased more significantly in the TVNS group compared to the control group. This suggests that auricular TVNS may increase sympathetic activity after exercise.

Respiration is closely related to ANS activity. With deep and slow breathing, sympathetic activity decreases while parasympathetic activity increases (Joseph et al., 2005). An increase in respiratory rate and a decrease in tidal volume may occur with sympathetic activity (Breskovic et al., 2010). Vagal fibers innervate bronchial muscles and glands, causing bronchoconstriction and secretion, while sympathetic fibers exert a bronchodilator effect. In their study on the effect of VNS applied to acute asthma patients, Feng et al. (2012) revealed that it caused a positive increase in FEV1 value (Feng et al., 2012). In our study, a significant difference was observed in the TVNS group, but no significant difference was observed in the control group. An increase was observed in the FEV1 and FVC values in the TVNS group. While PNS causes bronchoconstriction, the increase in FEV1 and FVC values due to TVNS may be related to the reactive increase in sympathetic system activity or the selective effects of stimulation.

Essential hypertension exhibits the consequences of sympathetic nervous system activation (Mancia et al., 2014). Cardiac vagal nerve activity actually increases and is crucial for maintaining cardiac function during exercise. It modulates coronary artery blood flow during exercise (Shanks et al., 2023). Research indicates that elevated sympathetic nervous system activity is mostly linked to elevated systolic blood pressure (Pal et al., 2013). In a pilot study examining the acute effect of vagus nerve stimulation on the bicycle ergometer test and physiological parameters in healthy young individuals, it was observed that although it did not affect the bicycle ergometer test, it could affect parameters such as respiratory rate and blood pressure (Hatık et al., 2022). During aerobic exercise, systolic blood pressure increases while diastolic blood pressure decreases. When we analyzed the effect of our study on blood pressure statistically, we found that systolic blood pressures were lower in the second measurement than in the first measurement. No significant difference was found in the TVNS and control group in terms of diastolic blood pressure, and the first and second measurements were equivalent. The fact that this decrease in systolic pressure was also present in the control group indicates that it may be related to the physiological recovery of the body after exercise.

The most commonly used method to evaluate ANS functions is HRV. The devices measuring HRV are ECG-based devices that allow us to distinguish between time and frequency-dependent measurement methods and parasympathetic and sympathetic effects. While RMSSD and PNS index, which are the parameters used in the study, give the activation of the parasympathetic nerve, SNS Index is the data showing the activation of the sympathetic nerve numerically (Shaffer et al., 2017). PNS and SNS indices were determined based on the results of the study Nunan et al. (2010) conducted with 21 thousand individuals (Nunan et al., 2010). PNS and SNS indices available in Kubios software were established based on their study. We used e¬motionFaros 180 to obtain HRV parameters and Kubios software to obtain the other data. In our study, the SNS Index value increased in the TVNS and control group compared to the first measurement. This result can be attributed to the increased activation of the sympathetic nervous system during aerobic exercise. However, the participants in the TVNS group also showed an increase compared to the first measurement value of PNS Index. This indicates that auricular TVNS can increase parasympathetic activity. However, there was no significant difference between the TVNS and control groups in terms of RMSSD values, and the first and second measurement values were found to be equivalent to each other. This may be due to Kubios software or because the increase in the parasympathetic system is not obvious.

In their study with rat subjects, Brighina et al. stated that low-frequency VNS affects the central nervous system and efferent fibers. In their study conducted with healthy individuals, Clancy et al. (2014) used auricular VNS and discovered that the activation of the parasympathetic system increased in autonomic functions (Clancy et al., 2014). We also used low-frequency (10 Hz) bilateral auricular TVNS in our study. When compared to the control group, auricular TVNS may increase both sympathetic and parasympathetic activity after exercise, and this effect may be selective. To our knowledge, our study is the first to evaluate the effect of auricular.

VNS in the early post-exercise period. Although parasympathetic activity is the main factor in recovery after exercise, high sympathetic activity seems to be important in this period, too. According to Buchholz et al. (2015), in which they mentioned sympathetic coactivation, that VNS can increase parasympathetic activity may also increase sympathetic activity reactively (Buchholz et al., 2015). Something similar may have occurred in our study.

Concluıon

Parasympathetic system activity is of significance in recovery after exercise. Auricular TVNS can accelerate sports recovery by increasing PA after exercise. The short duration of the study, that TVNS was performed for 5 minutes, the measurement of ANS activity together with TVNS, the small number of participants, and the low number of measurement repetitions can be considered among the limitations of the study. We are of the opinion that further randomized controlled studies with a larger sample are needed to examine the effect of TVNS on sports performance and recovery. Our study found that auricular TVNS can acutely affect parameters such as pulse, respiratory function, and ANS activity after exercise. The effects of TVNS may vary

according to the physiological needs of the body at the time. TVNS performed in the acute period after exercise may cause an increase in sympathetic activity together with parasympathetic activity.

Conflict of Interest

During the development and publication of this work, the authors did not reveal any conflicts of interest.

Funding Information

The authors declared that throughout the course of conducting and writing this study, they did not receive any grants.

Acknowledgement

We would like to express our gratitude to every volunteer who participated in the research and Prof. Dr. Mehmet ÜNAL.

Author Contibution

Study Design, E.O.G., A.V.O., H.I.U., H.K.A.; Data Collection, E.O.G, A.V.O, H.I.U.; Statistical Analysis, E.O.G., A.V.O., H.I.U., H.K.A., S.H.H.; Data Interpretation, E.O.G., A.V.O., H.I.U., H.K.A., S.H.H.; Manuscript Preparation, E.O.G., A.V.O., H.I.U., H.K.A., S.H.H.; Literature Search, E.O.G., A.V.O., H.I.U., H.K.A., S.H.H. All authors have read and agreed to the published version of the manuscript.

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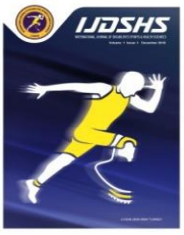

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

RESEARCH ARTICLE

The effect Criteria of Mate-Selection on Emotional Needs of Married Couples

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Abstract

Background and Aims: Partner selection has emerged as an important topic and research direction in behavioral ecology. This study aimed at determining life partner selection factors affect married couples' emotional requirements. **Methods:** Three hundred eighty-seven couples joined. For an efficient sample, we removed four individuals, owing to neglect and inadequate effort to answer survey items, from 383 people. The population was 25–45 years old, with 171 men and 212 women. **Results:** The mean and standard deviations for couples' Marital selection criteria (CMS) and emotional needs scale (ENS) were (49.6), psychological (10.5), and religious (5.36). Couples had high ENS (50.98). No indirect relationship existed between gender, number of children, (CMS) choice satisfaction, (ENS) among married couples, and (ENS) satisfaction. Child count and marital choice variables are directly and statistically associated with ENS satisfaction in married couples. The direct and indirect linkage model demonstrated that CMS and children had a statistically significant influence on married couples' ENS. There were no statistically significant differences in the criteria for choosing a life partner and satisfying (ENS) married couples by gender. However, education level affected intellectual, religious, physical, and formal dimensions and the total score. Education level did not affect favoring postgraduate education when meeting emotional needs. **Conclusion:** Despite the differences in some points of view between both genders about considering the criteria for choosing a future spouse, according to all participants, it was important for the participants to include psychological, cultural, familial, and social criteria for choosing a mate- selection

Keywords
Marital Selection Criteria (CMS), The Emotional Needs Scale (ENS), Couples

INTRODUCTION

Partner selection has emerged as an important topic and research direction in behavioral ecology (Andersson & Simmons, 2006), and the emotional and sexual aspects of intimacy in romantic relationships are important factors associated with relationship satisfaction between spouses (Yoo et al., 2014), Evolutionary, sociological, and cultural explanations validate life mate preferences. For instance, males appreciate beauty more than women (Dutta et al., 2023). Five study models evaluated the foundations and reasons for selecting a spouse, linking beauty, appreciation, and interaction between partners and showing gender disparities (Feingold, 1990). Girls pay more attention to psychological and economic criteria as preferences for marital choice compared to men, for example, girls are interested in the nobility of the husband and his ability to manage the family, and for men they care about being a housewife and a father Although there is a difference in some gender views on considering the criteria for choosing a future husband, it is important for participants to include psychological, cultural and family criteria It (Paul, 2002) is

Received: 11 January 2024 ; **Revised** ; 18 February 2024 ; **Accepted:** 02 May 2024; **Published:** 25 May 2024

How to cite this article: Aldawsari, H., Alfarraj, H., Meiri, E., Khatatbeh, Y., and Mıstarihi, W. (2024). The effect Criteria of Mate - Selection on Emotional Needs of Married Couples. *Int J Disabil Sports Health Sci*;7(3):502-512. https://doi.org/10.33438/ijdshs.1418077

advisable that, before marriage, young people take into account the above criteria for choosing a future spouse (Rafiee, 2023) People tend to marry couples of similar social status, such as those with the same educational attainment and professional status, and mixed marriage patterns have long been used as a measure of social distance between distinct groups (Choi & Wagner, 2023). Sexual selection has become an important research topic in behavioral ecology and human behavior, and the study of partner choice preferences across cultures and countries is gradually receiving increasing attention (Lu, 2023). Choosing a spouse is strongly tied to our life, indicating that being with the proper partner should boost delight. The intricacy of the process and preferences remain the subject of study (Conroy-Beam & Buss, 2016).

Curiosity, self-affirmation, and collectivism were inbuilt, according to McDougall in 1908. (Griffin & Tyrrell, 2013). Freud believes that sexual satisfaction and aggression drive human needs (Gough et al., 2013). Introduce nine psychological demands that people need to meet nourishment, development, safety, and well-being: safety, giving and getting attention, connecting with a community, and developing a deep, personal connection with at least one person: independence, reputation in family and peer groups, competence, privacy, meaning. If someone lacks closeness, this fundamental tendency urges them to establish acquaintances—social interactions (Corp et al., 2008). Physical and emotional closeness go together: For a long-term relationship, physical connection requires emotional closeness. Lack of emotional closeness amid a physical contact boom may cause trust, anger, irritation, and disorientation issues (Tappolet, 2022).

Marriage is a temporary stage in an individual's life that has always been emphasized as an extreme social ritual to satisfy emotional needs, including the need for love and intimacy with a partner, a companion in life, psychological needs, and joy (Kardan-Souraki et al., 2016). To respond correctly to an intimate partner's emotional signals and wants, emotional reactions must be interactive with crucial personal experiences. More emotional attunement to personal situations may limit emotions' adaptive function (Luginbuehl & Schoebi, 2020). Emotional need is "a desire that, when satisfied, leaves you feeling happy and satisfied, and when it is not satisfied, leaves you feeling unhappy" and frustrated (Yoo et al., 2014). All human beings have emotional needs, and when these needs are met, we experience emotional gratification; since emotions come from within us, achievement must come from within as well (Litzinger & Gordon, 2005). Relationships work well only when partners try to understand each other well (Ruan et al., 2023). Meeting the basic needs of a partner and forming relationships is essential, as romantic love helps reduce the chance of divorce (Sullivan & Davila, 2010). An individual's emotional needs shape partner preferences, behavioral manifestations, and gender differences and similarities in human sexual psychology, which vary by short-term and long-term mating contexts. (Collins et al., 2010) Partner preferences influence mating decisions based on individual, social, and environmental traits like partner value, life history strategy, gender, and cultural norms. They also affect attraction, retention tactics, patterns of deception, causes of sexual remorse, attraction to sexual exploitation cues, and fertility cues (Buss & Schmitt, 2019) Contemporary partner preferences can provide important clues to human reproductive history (Buss, 2023). Five prediction studies have examined gender variations in human partner choices based on evolutionary principles of parental investment, sexual selection, reproductive capacity, and sexual asymmetry in relation to parenting certainty. Expectations focused on how each sex rated earning power, ambition, diligence, youth, beauty, and chastity (Buss, 1989)

Criteria of Mate-Selection (CMS)

Prospective couples want friendly, trustworthy, long-term colleagues with outstanding parenting qualities who can fulfill our desire for belonging and give a closer, more protective, accepting, and secure partnership (Valentine et al., 2020). The choice of partner is a crucial link in the continual growth of human civilization and a complicated challenge in decision-making. Partner selection includes not only people's preferences but also their ways (Hou et al., 2020) selection process may be carried out according to several criteria, including physical appearance, intelligence, social status, and wealth. Couples have expectations of both individuals about how to behave (Li & Choy, 2022). Human relationship preferences explain why people choose, and men and women have varied standards for a good or ideal spouse. The socioeconomic level of a

possible mate also matters, particularly in poorer countries where social standing is more important. (Stone et al., 2008) when choosing a partner of the opposite sex, females give a high preference to a physically attractive partner (Buss & Barnes, 1986 (Buss & Barnes, 1986) and women are attracted to more prominent male traits (such as a solid jaw, muscular body, and more extended height (Frederick & Haselton, 2007). The traits men and women value under economic restrictions have been examined. One research pushed participants to allocate monies across categories to their virtual spouses within a budget and according to women's preferences (Li et al., 2002). Similar to prioritization in both Eastern (e.g., Malaysia and Singapore) and Western (e.g., UK, Australia, Norway) (Thomas et al., 2020).

Several research studies have explored marital choice criteria in diverse situations and the five personality characteristics and partner-choosing techniques. Over 377 university students participated, and the five personality characteristics and mate-choosing procedures were significantly correlated (Keldal, 2022), Moreover, for the (Keldal, 2022), 310 people were surveyed. Religious, social, artistic, cultural, and familial materialism were used to choose spouses, and the "monthly income criterion" favored women. (61.3%) (Al-Alawi & Al Gharaibeh, 2022; Lu, 2023) and to reveal long-term differences and short-term partner choice preferences among young people in China and South Korea. 273 Chinese (males = 22.07, SD = 1.75) and 181 Koreans (males = 21.75, SD = 2.05) (Al-Alawi & Al Gharaibeh, 2022) that education played a decisive role in long-term partner selection for both Chinese males and females, and (Lu, 2023) As SJ (2013), 384 university students were surveyed on their marital preferences. Students in the research preferred spouses who were tolerant, empathetic, sympathetic, of the same faith and had never been married. At the same time, men prioritized tolerance (SJ, 2013) and empathy for predicted spouse traits compared to females. To determine whether spouse selection variables affect marital compatibility among married workers, 245 instructors replied. The correlation matrix between spouse decision-making and marital compatibility showed that economic criteria were most related, followed by physical, religious, and values, psychological, and social dimensions. There were no significant variations ($\alpha<0.05$) in spouse selection criteria based on sex, economic level, and location. The study showed no significant differences ($\alpha<0.05$) in marital compatibility based on economic level (Gizan, 2019). A study (Olcay Imamoğlu et al., 2019) examined how Turkish men and spouses vary in love, relationship, and marital satisfaction issues participated in 465 pairings. 33% of marriages were minor. The research found that men in self-selected marriages reported greater love than those in forced marriages, while wives reported more issues than husbands regardless of marital type. (Ghyzan, 2019) gender-specific selection criteria. The research included 540 randomly chosen pupils (Olcay Imamoğlu et al., 2019; Bensayah, 2018). 1260 The study focused on the cultural aspect of Chinese and American individuals and unique expressions regarding the relative priorities of choosing urticaria (Chen et al., 2015). Some research has shown that women rely more on emotions as a coping technique than males when choosing a spouse. The research included 115 men and 232 women from relevant websites and social media (Liddon et al., 2018). In Malaysia, a study (Alavi et al., 2014) determined the partner selection criteria for Malaysian graduate students (Bensayah, 2018). Study subjects valued internal traits such as religion and external traits such as physical attractiveness when choosing a partner. Rafiee (2023) also studied determining partner selection criteria for nursing students. With the (Chen et al., 2015) 22-33 and 23-39 years, and from the point of view of girls (Liddon et al., 2018) 46 (Alavi et al., 2014), there were 17 important criteria and five shallow criteria. There was a gender difference in the importance of 29 criteria (Rafiee, 2023).

Previous research has indicated that both sexes strongly value these attributes in prospective relationships, but few studies have examined whether engaged couples react positively to warm and trustworthy partners. Their romantic partner preferences (Valentine et al., 2020). Five predictive studies on gender differences in human partner preferences examined evolutionary concepts of parental investment, sexual selection, human reproductive ability, and sexual asymmetry regarding the certainty of parenthood versus motherhood. Expectations focused on how each sex evaluates earning capacity, ambition, diligence, youth, physical attractiveness, and chastity (Buss, 1989) As shown in the previous

presentation, most research and studies on marital choice criteria focused on the psychological aspects of satisfying relational needs and various factors, including physical, behavioral, material, moral, and aesthetic, which formed the preconceived image for searching for a life partner and preferences related tot.

Emotional Needs (EN)

The study of basic psychological needs has undergone a strong recovery, driven in part by the theory of basic psychological need, one of the six mini-theories within the theory of the report of the sucker (Vansteenkiste et al., 2020; Ryan, 2000) the need for independence (Deci & Ryan, 2000) growth, cultures and differences. Basic psychological needs are widely defined as the critical resources underlying individuals' natural tendency to move toward increased self-regulation, adaptation, and increased (Knudson-Martin & Kim, 2022). Our emotional needs are what make us happy, fulfilled, or at peace. We may feel disappointed, upset, or unhappy without them. Emotional requirements include feeling respected, prosperous, safe, and part of the community. Humans want emotional nourishment, like food and water. Natural entitlement to emotional nourishment (Sala, 2013). Each person has a unique set of emotional needs, which may be the product of arrangement, genetic predisposition, identity, and some individual factors (Layder & Layder, 2009). Maslow's hierarchy, presented as a hierarchy, shows the evolution of human needs for basic needs such as food and water. At the bottom of the pyramid to self-realization at its top. Maslow's research identified nine specific emotional needs every day for all people across cultures (Johnson, 2008).

Studies have examined direct and indirect relationships between attachment insecurities (anxiety and avoidance) and sexual pleasure via sexual urges. Two hundred four couples replied. The research found that partner consent, self-affirmation, and closeness (Brassard et al., 2023) Studie (Luginbuehl & Schoebi, 2020) affect individual differences in the dynamics of moment-in-the-moment emotions on interpersonal response and relationship satisfaction. Yoo et al. (2014) have examined how emotional and sexual closeness affects relationship satisfaction in interpersonal relationships. The research included 335 pairings. The course analysis showed that sexual satisfaction significantly predicted emotional intimacy in husbands and wives, but emotional intimacy did not appear to affect sexual satisfaction. Gender differences were also found in how a husband's perception of sexual satisfaction affects his relationship satisfaction with his partner. A study (Litzinger & Gordon, 2005) linked spousal communication, sexual pleasure, and marital satisfaction among 387 couples. Regression studies reveal that sexual and communicative pleasure independently influence marital satisfaction. If couples communicate well, sexual pleasure does not affect marital contentment.

MATERIALS AND METHODS

Participants and procedure

Data were collected during the fall semester of the 2023 academic year A year in the Kingdom of Saudi Arabia. Participants were recruited through advertisements within psychotherapy and family counseling centers and by Notices posted on bulletin boards and social media accounts. Participants were provided with a link to access the online administered questionnaire, which was accessed first. Provide an informed consent statement. All measures have been implemented in Arabic. A total of 387 married couples participated. We excluded four participants, as detailed below, for negligence and insufficient effort to respond to the survey instruments, resulting in an adequate sample of 383 participants. Age ranges from 25 to 45 years. The number of males was (171), and (212) females and the number of those holding a bachelor's degree was (164), a master's degree was (83), and a high school degree was (136). **(**Figure 1)

Ethical approval

The study titled “The effect Criteria of Mate-Selection on Emotional Needs of Married Couples” was approved [numbered: 136-156707-12] *08/01/2024.* The training unit reviewed the title of the study and approved the application of the study tools and procedures in the group of schools. Participant provided informed consent, with the volunteer form covering research details, risks, benefits, confidentiality, and participant rights. The research strictly adhered to the ethical principles of the Declaration of Helsinki, prioritizing participant's rights and well-being in design, procedures, and confidentiality measures.

Additional precautions were taken by the investigator(s) to protect the volunteers in this study.

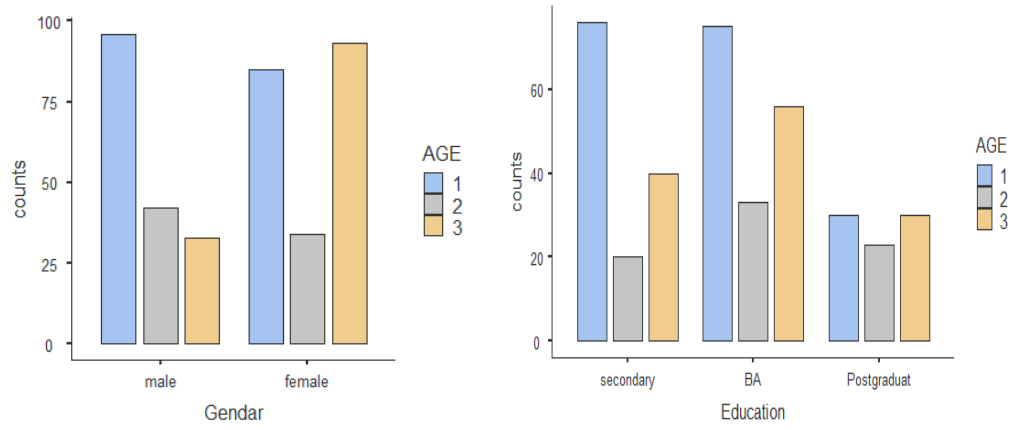

Figure 1. Shows the study subjects according to demographic variables

Data collection tools

Participants completed a demographic questionnaire in which we inquired about the following characteristics: age, gender, years of marriage, and level of education, and the administration of the following psychometric measures followed this.

Marital Selection Criteria (CMS)

The scale of criteria for choosing a life partner (CMS) The scale prepared by (Kahila, 2016) consists of 20 items distributed over six criteria, namely: the psychological criterion consists of four items (2,4,8,9), the social criterion consists of three items (12,15,16) the intellectual criterion consists of three items (3,5,10), the religious criterion consists of two items (11,14), the physical criterion consists of three items (17,18,19,20), and the formal criterion consists of four items (1,6,7,13). The values of the correlation coefficients for the dimensions ranged from (0.632-0.761), and the values of the correlation coefficients of the paragraphs ranged between (0.269-0.702). The stability coefficient of the instrument was (0.64). For the purposes of correcting the tool, each paragraph is given four options, which are (not required and given one grade; desirable and not necessary and given two degrees; average importance and given three degrees; and an essential requirement. This option is given four degrees)

Emotional Needs Scale (ENS)

The ENS Emotional Needs Scale prepared by (Van den Broeck et al., 2008) consists of 14 items to measure emotional needs. Moreover, the response options on the tool consist of five options where the option given is the option never and given a degree, the option is absolute and given two degrees, the option is sometimes given three degrees, the option is often given four degrees, and the option is always given.

Statistical Analysis

We used Jamovi 2.4 and spss 23 software for data cleaning and descriptive، correlational analyses. We used the Jamovi 2.4 packages to exclude four participants (listed above) who did not assist. Make an adequate effort to respond to the questions, with at least one example of entering the same response more than ten times in a row. Stuff. We implemented a jamovi package to base it on small Amounts (<5%) of missing item level values with scale scores summed. We used the Jamovi package for calculating internal consistency and labeling for recipes, eatables for correlations, and MANCOVA effects. Linear regression paths used to model direct effects and maximum likelihood estimation were treated. To test for mediation, we calculated cross-products of pairs of direct path coefficients to derive mediation indirect effects.

RESULTS

It is clear that the means Standard deviations for CMS ENS among couples reached (49.6), which was highest after the psychological dimension (10.5), followed by the physical dimension (9.54), followed the appearance dimension (8.77), and the intellectual dimension (8.16), followed by the social dimension (7.23) And in last place came the religious dimension

(5.36). Regarding the emotional needs scale of married couples, the score was high (50.98) (Figure 2).

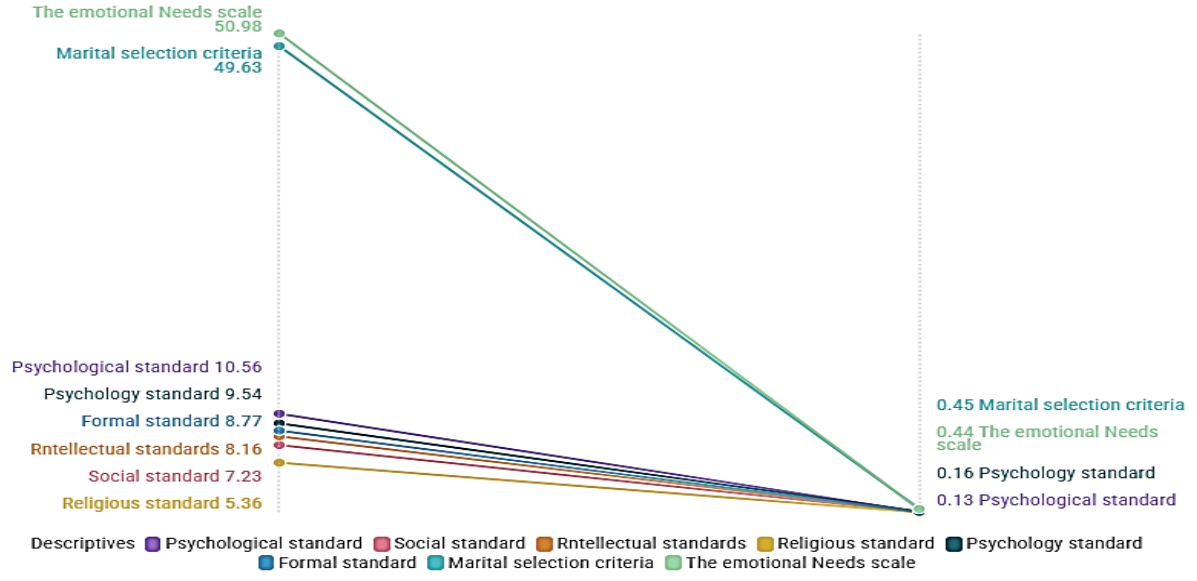

Figure 2. The effect of CMS IN ENS Among couples with some demographic variables

Table 1 shows that there is no statistically significant indirect effect between gender, the number of children, and the extent to which married couples are satisfied with marital choice and marital selection criteria, but there is a statistically significant direct affective relationship between the number of children and marital choice and marital selection criteria satisfaction. Between gender and married couples' emotional requirements. The direct and indirect connections model shows that the number of children and satisfaction with marital standards significantly affect married couples' emotional needs. The figure also demonstrates the correlations between the research variables (gender, number of children, marriage choice criteria satisfaction, overall selection criteria, and emotional requirements fulfillment among married couples).

Table 1. Standardized direct and indirect، mediation tests

Test	*Effect*	*HERSELF*	*β*	*with*	*p*
Indirect	Gender ⇒ CMS ⇒ ENS	0.0347	2.95e−5	0.0148	0.988
	Number ⇒ CMS ⇒ ENS	0.0353	3.45e−4	0.1696	0.865
	stander ⇒ CMS ⇒ ETC	0.0728	0.00273	0.6853	0.493
Component	Gendar1 ⇒ CMS	0.9494	7.88e−4	0.0148	0.988
	CMS ⇒ US	0.0467	0.03746	0.7828	0.434
	Number ⇒ CMS	0.9428	0.00922	0.1738	0.862
	stander ⇒ CMS	0.9627	0.07284	1.4181	0.156
Direct	Gender ⇒ ENS	0.8673	0.00603	0.1207	0.904
	Number ⇒ ETC	0.8613	0.10787	2.1714	0.030
	stander ⇒ ETC	0.8818	0.33420	6.9287	**< .001**
Total	Gender ⇒ ENS	0.8692	0.00606	0.1210	0.904
	Number ⇒ ETC	0.8630	0.10822	2.1738	0.030
	stander ⇒ ETC	0.8813	0.33148	6.8756	**< .001**

Table 2. Differences in MSC & ENS to the variable of educational level, gender, and number of children.

Tests of Between-Subjects Effects						
Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Say
Gender	Psychological standard	12.644	1	12.644	1.850	.175
	Social standard	.804	1	.804	.210	.647
	Intellectual standard	6.799	1	6.799	1.678	.196
	Religious standard	.768	1	.768	.298	.586
	Physical Standard	19.820	1	19.820	2.117	.147
	Formal standard	.000	1	.000	.000	.996
	Selection standards	27.960	1	27.960	.366	.546
	The Emotional Needs Scale	211.465	1	211.465	2.870	.091
Education	Psychological standard	16.965	2	8.482	1.241	.290
	Social standard	.727	2	.364	.095	.909
	Intellectual standard	68.774	2	34.387	8.488	.000
	Religious standard	18.287	2	9.143	3.545	.030
	Physical Standard	92.210	2	46.105	4.924	.008
	Formal standard	41.592	2	20.796	3.849	.022
	Selection standards	974.731	2	487.365	6.378	.002
	The Emotional Needs Scale	389.052	2	194.526	2.640	.073
Number of Children	Psychological standard	10.354	1	10.354	1.517	.219
	Social standard	3.351	1	3.351	.876	.350
	Intellectual standard	4.549	1	4.549	1.123	.290
	Religious standard	5.722	1	5.722	2.226	.137
	Physical Standard	25.117	1	25.117	2.695	.102
	Formal standard	2.030	1	2.030	.375	.541
	Selection standards	6.047	1	6.047	.079	.779
	The Emotional Needs Scale	294.725	1	294.725	4.033	.045
Error	Social standard	1449.579	379	3.825		
	Intellectual standard	1535.490	379	4.051		
	Religious standard	977.399	379	2.579		
	Physical Standard	3548.625	379	9.363		
	Formal standard	2047.725	379	5.403		
	Selection standards	28961.648	379	76.416		
	The Emotional Needs Scale	27921.313	379	73.671		
Total	Psychological standard	45322.000	383			
	Social standard	21499.000	383			
	Intellectual standard	27120.000	383			
	Religious standard	12012.000	383			
	Physical Standard	38529.000	383			
	Formal standard	31532.000	383			
	Selection standards	973290.000	383			
	The Emotional Needs Scale	1024051.000	383			

Table 2 shows that there were no statistically significant differences in the criteria for choosing a life partner and satisfying the emotional needs of married couples by gender. However, there were statistically significant differences by education level on the intellectual, religious, physical, and official dimensions and the total degree of t. It was also found that there were no differences in life partner selection criteria based on the number of children. However, there were differences in emotional needs satisfaction in favor of those aged 4–7.

PSU predicted the indirect effect of demographic variables: gender, level of education, and level of satisfaction with MSC (Figure 3).

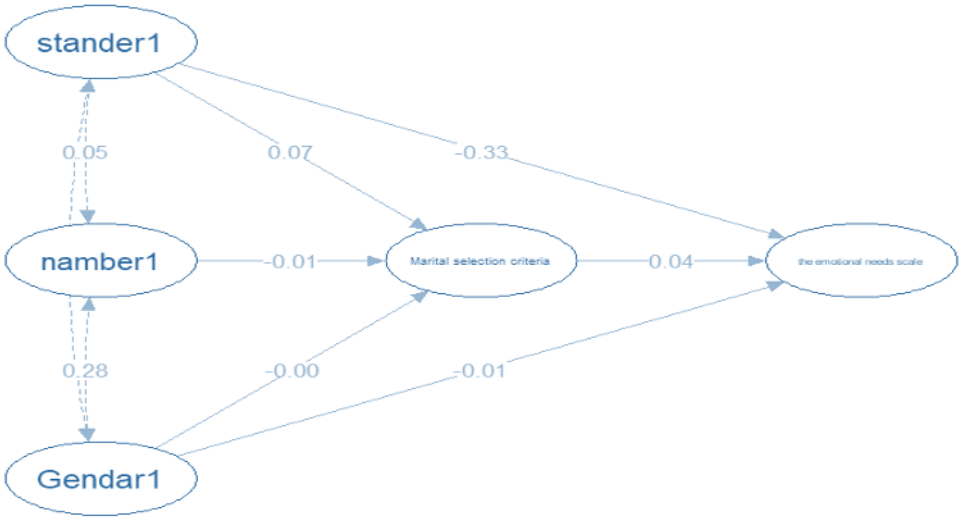

Figure 3. The direct effect of MSC & ENS among couples

DISCUSSION

The choice of partner is a crucial link in the continual growth of human civilization and a complicated challenge in decision-making. Partner selection includes not only people's preferences but also their ways (Hou et al., 2020). Basic psychological needs are widely defined as the critical resources underlying individuals' natural tendency to move toward increased self-regulation, adaptation, and increased (Knudson-Martin & Kim, 2022). Our emotional needs are what make us happy, fulfilled, or at peace.

The study found that couples' average CMS standard deviations were (49.6), with the psychological dimension (10.5) ranking first, followed by the physical dimension (9.54), the phenotypic dimension (8.77), the intellectual dimension (8.16), the social dimension (7.23), and the religious dimension (5.36). Married couples have high emotional requirements (50.98). These findings are due to the study's religious, cultural, and psychological context. This may illustrate the current freedom of marriage choice and promote the right of people to select and shape their marital ties, which is compatible with the theory of marital choice, which stresses the motivation-value-role phases (Schibik et al., 2023) value satisfaction via visual, aural, and non-interactive ways. The second stage (value) involves verbal values, and the third stage (role) involves the couple's capacity to operate in responsibilities allocated to both sides. Topics include whether gays or opposites marry, sex desire, self-acceptance, neuroticism, physical attractiveness, and men's more significant role in advancement. Courtship and projected role compatibility rather than real compatibility (Murstein, 1970). The theory of choice emphasizes accepting responsibility to meet your basic needs and those of your spouse and freedom from external control, and husbands may not have devoted full attention to the needs of themselves and their spouses before intervening (Fathollahzadeh et al., 2017; Scheller et al., 2023)

There was also no statistical significance for an indirect effect between gender, the number of children, and the extent to which married couples are satisfied with the criteria of marital choice. The logical result can be explained by the sample's characteristics and conditions that adhere to Islamic aspects and religious standards regarding the impact of gender and the number of children (Brassard et al., 2023; Buss, 2023; Choi & Wagner, 2023; Dutta et al., 2023; Lu, 2023; Rafiee, 2023; Ruan et al., 2023; Scheller et al., 2023; Schibik et al., 2023) There is also a statistically significant direct affective association between the number of children and marriage choice, emotional requirements, and gender. Sexual attraction and the development of more

stable preference patterns may be able to interpret a partner's preference patterns, which is consistent with the final explanations because natural selection works on the partner's fixed preferences as well as the learning system and improves them. In this method (Collins et al., 2010; Gonçalves et al., 2011; Gough et al., 2013; Griffin & Tyrrell, 2013; Sala, 2013; SJ, 2013; Sullivan & Davila, 2010), The direct and indirect links model shows that the number of children and satisfaction with marital standards have a statistically significant influence on married couples' emotional needs. The chart also demonstrates how gender, number of children, satisfaction with marriage choice criteria, overall selection criteria, and emotional needs fulfillment among married couples relate. Its psychological and biological causes are still unknown, and raising women's socioeconomic level does not erase or minimize gender inequalities in partner choices and marriage aspirations. Women's socioeconomic norms rise with their position (Alavi et al., 2014; Chen et al., 2015; Din et al., 2015; Yoo et al., 2014). According to evolutionary theory, males favored couples with more physical beauty, while women chose couples with higher wealth, education, self-confidence, intellect, dominance, and social standing. Lower relationship involvement lowers education and physical appeal, particularly for men (Abdullah, 2011; Buunk et al., 2002; Dutta et al., 2023; Lu, 2023) Different marital choices and emotional needs can be explained by age, education, culture, nature of marital choice, the influence of the family and social environment on family choice, premarital relationships, emotional dating, and other influencing factors, as well as emotional desires and the individual's nature and personality traits (Abdullah, 2011; Badahdah & Tiemann, 2005; Buss & Schmitt, 2019; Liddon et al., 2018)

Recommendations

Training prospective spouses to meet marital choice requirements. Teaching married couples about relationship requirements. Stress the relevance of CMS and emotional needs to therapists and family therapy professionals.

Funding

This work was supported and funded by the Deanship of Scientific Research at Imam Mohammad Ibn Saud Islamic University (IMSIU) (**grant number IMSIU-RG23149**).

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethics Committee

The study titled “The effect Criteria of Mate-Selection on Emotional Needs of Married Couples” was approved [numbered: 136-156707-12] *08/01/2024.* The training unit reviewed the title of the study and approved the application of the study tools and procedures in the group of schools.

Author Contributions

Study Design, AKH, IAA; Data Collection, AKH; Statistical Analysis, AKH; Data Interpretation, IAA, SSM; Manuscript Preparation, SSM, IAA; Literature Search, AKH, IAA. The published version of the manuscript has been read and approved by all authors.

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International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

Employment of Disabled Persons with Multiple Sclerosis in the Republic of Slovenia

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Abstract
Education, active involvement in the workforce, and securing employment opportunities are essential pillars for individuals with disabilities to attain autonomy and self-sufficiency. However, due to lower education levels and inherent limitations, they often face barriers in securing and maintaining employment. Enhancing their employability through various training programs and raising awareness among employers about workplace accommoda-tions is essential. Slovenian legislation facilitates this but excludes individuals without recognized disability status from disability rights. This study aims to explore the disability status of indi-viduals diagnosed with multiple sclerosis (MS) under relevant legislation. It examines Slovenian disability legislation, protection, and recognition of disability for those with MS through legislation analysis and a survey of 85 adult MS Association of Slovenia members. Findings reveal disparities in rights based on the legal basis of disability status acquisition. Those under the Vocational Rehabilitation and Employment of Persons with Disabilities Act (ZZRZI) lack disability benefits. Consolidating relevant legislation into a unified statute for disability recognition and establishing a single MS registry is proposed. Survey results indicate an 85% disability recognition rate, with 14% full-time employees, 21.2% part-time employees, 9.4% job seekers registered with the Employment Service of Slovenia (ZRSZ), and 1.2% students among respondents. No prior research exists on MS-related employment in Slovenia, suggesting the need for future studies to monitor employment's impact on health status changes, sickness absence, workplace adjustments, employment opportunities, and suitable work environments for individuals with MS.

Keywords
Rights, Persons With Disabilities, Multiple Sclerosis, Retirement, Working Time

INTRODUCTION

In legal theory disability is defined as a permanent or more enduring, congenital or acquired physical or mental impairment in the functioning of the human body that cannot be remedied by medical treatment or medical rehabilitation; it results in total or partial inability to pursue education, work or independent living (Strban, 2012).

The Slovenian legislation predominantly uses the terms disabled persons or persons with disabilities (Murgel, 2020). Among the most important statutes, we should mention the Personal Assistance Act (ZOA), which in Article 1 defines a person entitled to personal assistance as an individual with long-term physical, mental, intellectual or sensory impairments which, in combination with various obstacles, may limit him or her from participating fully and effectively in society on an equal basis with others in all areas of life, with equal opportunities, greater independence, activity and equal inclusion in society, in accordance with the provisions of the Convention on the Rights of Persons with Disabilities.

Social Inclusion of Disabled Persons Act (ZSVI) regulates the rights and the procedure for acquiring the status of a person with disabilities, whereby persons with disabilities are defined in

Received: 11 January 2024 ; **Revised** ; 25 March 2024 ; **Accepted:** 02 May 2024; **Published:** 25 May 2024

How to cite this article: Weber, N., and Doljak, S.A. (2024). Employment of Disabled Persons with Multiple Sclerosis in the Republic Of Slovenia. *Int J Disabil Sports Health Sci*;7(3):513-526.https://doi.org/10.33438/ijdshs.1418290

Article 1 as persons with permanent congenital or acquired impairments who, as a result of their disability, are unable to integrate socially in the community without the provision of social inclusion services and are unable to independently perform most or all of the necessities of life and to provide for their own subsistence, the right to financial benefits and the opportunities provided by the state for their equal integration into society.

Article 3 of the ZZRZI defines a person with a disability as a person who acquires such a status under ZZRZI or under other regulation, and a person who has been determined by a decision of a competent authority to have permanent consequences of a physical or mental impairment or a disease, and who is therefore substantially disadvantaged in his/her chances of obtaining or maintaining employment, or of advancing in the workplace.

The term "worker with a disability", as used hereinafter, refers to an insured person who has been diagnosed as having a disability under the Pension and Disability Insurance Act (ZPIZ-2) and who has acquired any of the rights under the disability insurance. It is therefore important to understand that those who have a recognized category of a disability but have not been granted any disability insurance rights are not workers with disabilities (Murgel, 2020).

According to Article 63 of the ZPIZ-2, a disability is established if, due to changes in the state of health which cannot be remedied by treatment or medical rehabilitation measures and are established in accordance with this Act, the insured person's ability to secure or maintain a job or to advance in his/her profession is impaired.

EMPLOYMENT OF PERSONS WITH DISABILITIES

Persons with disabilities are one of the most vulnerable groups on the labour market and for this reason are more difficult to employ (Murgel, 2020).

Prohibition of Discrimination

At this stage, it is worth mentioning the general principle of non-discrimination set out in Article 6 of the Employment Relations Act (ZDR-1). According to this principle, an employer must ensure equal treatment of a jobseeker (applicant) in the recruitment process or of a worker during the employment relationship and in connection with the termination of the employment contract, irrespective of nationality, racial or ethnic origin, national and social origin, sex, skin colour, health, disability, religion or belief, age, sexual orientation, marital status, trade union membership, financial situation or other personal circumstances in accordance with this Act, the regulations on the implementation of the principle of equal treatment and the regulations on equal opportunities for women and men. The employer must ensure equal treatment with regard to the personal circumstances referred to above, in particular with regard to recruitment, promotion, training, education, retraining, wages and other employment benefits, absences from work, working conditions, working time and termination of the employment contract. Direct and indirect discrimination on the grounds of any of the personal circumstances listed is prohibited. Direct discrimination exists if, due to a particular personal circumstance, a person has been, is being or is likely to be treated less favourably than another person in the same or similar situations. Indirect discrimination on grounds of personal circumstances exists where a person with a particular personal circumstance has been, is or could be placed in a less favourable position than other persons in the same or similar situations and conditions as a result of an apparently neutral regulation, criterion or practice, unless that regulation, criterion or practice is objectively justified by a legitimate aim and the means of achieving that aim are appropriate and necessary. Direct or indirect discrimination includes instructions to discriminate against persons on the basis of any personal circumstance. Differential treatment based on any of the above personal circumstances does not constitute discrimination only if, by reason of the nature of the work or of the circumstances in which the work is carried out, a particular personal circumstance constitutes an essential and determining condition of the work and such a requirement is proportionate and justified by a legitimate objective.

The provision cited (ZDR-1) implements Directive 2000/78/EC establishing a general framework for equal treatment in employment and occupation, which prohibits discrimination on grounds of disability.

The prohibition of discrimination in the employment of persons with disabilities is also specifically provided for, for example, in ZZRZI.

Young persons with disabilities should be supported in their transition to the labour market

while they are still attending school. The legal basis for this is the Article 52 of the Constitution of the RS, which provides that persons with disabilities are guaranteed protection and training for work in accordance with the law, and in particular children with physical and mental disabilities and other severely disabled persons. The education and training for disabled persons and physically or mentally handicapped children and other severely disabled persons shall be financed from public funds.

In the Slovenian legal context, the Resolution on the National Programme for Youth 2013-2022 promotes the adoption of measures for the employment of young people with disabilities. In fact, among the objectives of greater social inclusion of young people with fewer opportunities, it was pointed out that special attention should be paid to the victims of social exclusion, among whom people with disabilities are explicitly mentioned.

Members of the European Parliament approved the European Parliament resolution on a post-2020 European Disability Strategy (2019/2975(RSP)), which sets out the priorities for a new post-2020 disability strategy, building on the European Disability Strategy 2010-2020.

In March 2021, the European Commission adopted a strategy on the rights of persons with disabilities for the period 2021-2030 that include a recommendation that persons with disabilities should be given equal access to employment.

Persons with Disabilities in the Work Process

Slovenian legislation regulates the work situation of persons with disabilities in different ways. Roughly speaking, persons with disabilities are divided into those who are capable of being trained to live and work independently (their situation is regulated by ZZRZI) and those who are permanently unable to do so (their situation is regulated ZSVI) (Murgel, 2020).

Persons with disabilities can be employed in different manners: in an ordinary working environment, in social enterprises employing persons with disabilities and in supported and sheltered employment in jobs compatible with their abilities.

Employers with at least 20 workers are obliged to employ a certain proportion of persons with disabilities. Persons with disabilities and employers may be granted various financial benefits, provided by law, to enable persons with disabilities to be included in employment on an equal basis.

The Decree establishing the employment quota for persons with disabilities sets out, among other things, the share of workers with disabilities in the total number of workers working for each employer (the quota), proof of compliance with the quota, the calculation and payment of commitments and incentives for employing persons with disabilities, and the de minimis aid to employers for employing persons with disabilities.

The quota is set according to Article 3 of the aforementioned Decree, according to different activities, according to the areas covered by the Standard Classification of Activities Decree. The following quotas are set:

2% quota for:

G) trade; maintenance and repair of motor vehicles,
I) catering,
J) information and communication activities,
K) financial and insurance activities,
M) professional, scientific and technical activities,
O) activities of public administration and defence; activities of compulsory social security,
R) cultural, amusement and recreation activities,
S) other activities,

3 % quota for:

F) construction,
H) transport and storage,
L) real estate activities,
P) education, 6 % quota for:
A) agriculture and hunting, forestry, fisheries,
B) mining,
C) manufacturing,
D) electricity, gas and steam supply,
E) water supply; sewage and waste management; environmental remediation,
N) other miscellaneous business activities; and
Q) health and social welfare.

The quota may be reduced by one percentage point for employer subject to its obligation if he or she employs fewer than 50 persons but may not be less than two percentage points.

An employer subject to the quota may fulfil its obligation in one of two ways, either by employing the prescribed number of persons with disabilities as prescribed by law, or by paying a contribution to encourage the employment of persons with disabilities equal to 70% of the minimum wage for each person with disabilities he or she would have to employ to meet the quota.

If the employer does not meet the quota by employing disabled persons, he or she may reduce the obligation to pay the contribution to encourage the employment of persons with disabilities, in whole or in part, on the basis of a business cooperation agreement concluded with a social enterprise employing persons with disabilities or an employment centre as a substitute for meeting the quota. A business cooperation agreement concluded and fulfilled with such of a social enterprise or an employment centre in a calendar year shall be deemed to be a substitute for meeting the quota.

The employer may also operate as such of a social enterprise. The conditions of operation andthe status are laid down in ZZRZI.

The state provides various incentives for the employment of persons with disabilities. The following financial incentives may be granted under the ZZRZI for the more equal integration of persons with disabilities into employment:

Wage subsidies for persons with disabilities,

Payment of the costs of adapting workplaces and means of work for persons with disabilities,

Payment of the costs of services in supported employment,

Exemption from pension and disability insurance contributions for employed persons with disabilities,

Bonuses for exceeding the quota,

Annual awards to employers for good practice in the field of employment of persons with disabilities, and

Other incentives in the field of employment of persons with disabilities and job retention for persons with disabilities, and other development incentives.

It should be noted that employers are not obliged to publish a job vacancy for a person with a disability.

Labour Law Protection

Persons with disabilities enjoy special protection under labour law. Article 116 of the ZDR-1 provides that an employer may terminate the employment contract of a disabled person on the grounds of inability to perform work under the terms of the employment contract on the grounds of disability and on business grounds in the cases and under the conditions laid down in regulations, governing pension and disability insurance, or in the regulations, governing vocational rehabilitation and employment of disabled persons.

Disability as such cannot be a reason for termination of an employment contract. The employer must first offer him or her a new contract for another suitable job (Belopavlovič et al., 2016). Article 40 ZZRZI provides that an employer may terminate an employment contract of a disabled person (who does not have the status of a worker with a disability) for a business reason or because he or she is unable to perform work under the terms of the employment contract due to the disability, if at the same time he or she offers the person a new employment contract for an indefinite period of time in another job, which corresponds to the person with a disability's professional education, training and capacity for work in accordance with this Act or the regulations governing pension and disability insurance, or, on the basis of an agreement with another employer, ensures that the other employer offers him or her an employment contract of indefinite duration in a suitable job with him or her. If the person with a disability accepts the offer of his employer (the employer may also conclude an agreement with another employer to ensure that the latter concludes a contract of indefinite duration with the person with a disability in an appropriate job), he or she must conclude a new contract of employment within 30 days of receipt of the written offer. If the person with a disability accepts the employer's offer of indefinite employment in another suitable job, he or she has no right to severance pay but retains the right to challenge the validity of the grounds of termination before a competent court.

If the person with a disability does not accept the employer's offer of a new contract of indefinite duration in another suitable job within 30 days of receipt of the written offer, he or she shall not be entitled to severance pay.

If the person with a disability accepts the offer of another employer of indefinite employment in suitable work with that employer, the employer shall not be obliged to pay him a severance payment if the other employer undertakes in the employment contract to take into account the length of service of the worker with both employers in respect of the minimum notice period and the entitlement to severance pay.

In the case of workers with disabilities (the term is subject to the provisions of Article 101 of the ZPIZ-1, a worker who has been granted rights on the basis of established disability of category II or III by a final decision and who has an

employment contract for an indefinite period of time in the territory of Slovenia must be offered by the employer to perform other work in a job in accordance with his/her remaining working capacity and professional education or training, or to be provided with vocational rehabilitation or with part-time work, except in cases where the employer may terminate his/her employment contract in accordance with the retirement legislation and the regulations on labour relations.

If a worker has been granted the right to vocational rehabilitation on the basis of a category II disability by a final decision, the employer must terminate the employment contract on grounds of disability only after the successful completion of the vocational rehabilitation, and at the same time as the termination of the employment contract, the employer must offer the worker a new contract of employment for a different job, in accordance with the vocational rehabilitation contract and the employment relationship rules. The provisions of an otherwise valid employment contract shall not be enforced during the insured person's vocational rehabilitation in so far as they are regulated by the vocational rehabilitation contract.

A worker who has been granted, by a final decision, the right to part-time work or the right to transfer to another post on the grounds of a category III disability or a category II disability after the age of 50 years shall have his employment contract terminated by his employer on a regular basis on the grounds of disability and, at the same time as the employment contract is terminated, shall be offered a new contract of employment for less than full-time work or for work in another post, in accordance with the regulations on employment relations.

When providing rights and employment to insured persons who have incurred a disability or when choosing another work post, the employer must take into account:

The opinion of the disability commission on the insured person's remaining working capacity,

The insured person's qualifications after successful completion of vocational rehabilitation; and he provisions of the law governing employment relations and collective agreements.

It should be noted, however, that the above protection applies only to cases of proven business reasons or incapacity to work under the terms of the employment contract on grounds of disability. An employer may terminate the employment of a person with a disability under exceptional circumstances justifying dismissal, regular dismissal for just cause, or due to incapacity, on the condition that these grounds are unrelated to the disability. Additionally, termination is permissible if the employee fails to achieve the expected work results due to the disability or in cases where proceedings for the employer's liquidation have commenced (Weber, 2020).

Similarly, an employer will be able to terminate the employment contract of a person with a disability who fails to sign a rehabilitation contract within the time limit, fails to start or complete rehabilitation within the time limit, fails to fulfil the obligations under the rehabilitation contract, or fails to take up a job offered by the employer in a different position or with part-time work according to the decision on disability (Weber, 2020).

INCAPACITY FOR WORK AND ACQUIRING THE STATUS OF PERSON WITH A DISABILITY

The Article 9(1) of the Labour Market Regulation Act (ZUTD) specifies that individuals between the ages of 15 and 65 who are not completely incapable of work under ZPIZ-2 or deemed unemployable under ZZRZI are considered unemployed.

ZZRZ-1

ZZRZI regulates the employment opportunities of persons with disabilities and other persons who have acquired the status of a person with a disability under other regulations, as well as the rights of persons over 15 years of age who are registered as unemployed with the ZRSZ and who do not have the status of a person with a disability, but who have a reduced chance of being employed or of retaining employment because they suffer from permanent consequences as a result of a physical or mental impairment or illness.

The status of a disabled person under ZZRZI may be acquired by a person who:

Has not acquired the status of a disabled person under other legislation or has not been recognised by a decision of a competent authority as having permanent consequences as a result of a physical or mental impairment or illness and is therefore significantly less likely to be employed or to remain employed,

İs registered as unemployed with the ZRSZ,

Has turned 15 or who is not older than the lowest retirement age referred to in the regulations on pension and disability insurance; and

Meets the criteria laid down by ZZRZI.

Exceptionally, a person who is employed may also acquire the status of a person with a disability under this ZZRZI if he/she fulfils certain conditions (conditions listed in the first, third and fourth indent of the first paragraph Article 10 of the ZZRI).

In order to obtain such a status under ZZRZI, the following must be established:

The permanent consequences of a physical or mental impairment or illness,

Difficulties in activities which affect his or her employability; and

İmpediments to integration into the working environment as defined by the International Classification of Functioning, Disability and Health.

Rules on criteria and procedure to acquire the status of a person with disability and the right to vocational rehabilitation and to assess employment opportunities of persons with disabilities and on activities of rehabilitation commissions specify in more detail the content of the criteria and procedure for obtaining the status of a disabled person under ZZRZI, for recognising the right to vocational rehabilitation and for assessing the employment opportunities of persons with disabilities, and regulate the work of rehabilitation commissions.

ZPIZ-2

According to Article 65 of the ZPIZ-2 the causes of disability are:

work-related injury;

Occupational disease;

Disease;

injury outside work.

According to Article 59 ZPIZ-2, a person is totally incapable of work if he/she has a category I disability.

Article 63 of the ZPIZ-2 distinguishes three categories of disability:

Category I is given if the insured person is no longer able to carry out organised gainful work or is unable to carry out his/her occupation and no longer has any residual capacity for work;

Category II is established if the insured person's capacity to work in his/her occupation is reduced by 50 per cent or more;

Category III is given if the insured person is no longer able to work full-time but is able to carry out certain work on a part-time basis, at least four hours a day, or if the insured person's capacity to work in his/her occupation is reduced by less than 50 per cent, or if the insured person is still able to work in his/her occupation on a full-time basis but is unable to work in the job in which he/she is employed.

According to Article 63(3) of the ZPIZ-2 the occupation is defined as work in the job in which the insured person works and all work corresponding to the insured person's physical and mental capacities, for which he or she has the appropriate professional education, additional training and work experience required for certain jobs, in accordance with statutes or collective agreements.

Article 64 of the ZPIZ-2 provides that residual capacity to work for disability categories II and III is given in the following cases:

İf the insured person is able to work full-time and with a work effort which does not aggravate his/her disability, in another job corresponding to his/her professional education or training,

İf the vocational rehabilitation enables the insured person to be trained for other full-time work in another job,

İf the vocational rehabilitation enables the insured person to be trained for another job for at least four hours a day,

İf the insured person is able to work for at least four hours a day.

DISABILITY RIGHTS

In this section, we only deal with the rights of people with disabilities linked to the employment relationship.

Right to Disability Pension

The conditions for entitlement to disability pension are laid down in Article 41 of the ZPIZ-2.

The right to receive disability pension is acquired by:

An insured person who has incurred a category I disability;

An insured person who has incurred a category II disability and is unable to engage in other full-time work without vocational rehabilitation, which is not provided because he is over 55 years of age;

An insured person who has acquired a category II disability and is unable to engage in other part-time work of at least four hours a day

without vocational rehabilitation, but is not entitled to it, because he is over 50 years of age;

An insured person who has incurred a category II or III disability and is not provided with suitable employment because he has reached the age of 65.

Article 42 of the ZPIZ-2 defines that if the disability is the result of an occupational injury or disease, the right to disability pension is acquired irrespective of the length of the pension qualifying period, but if the disability is the result of an injury outside work or a disease, the right to disability pension is acquired on condition that, at the time of the disability, the insured person has completed a pension qualifying period covering at least one-third of the period from the attainment of the age of 20 years until the onset of the disability, counting the years of work as full years.

Article 43(1) of the ZPIZ-2 defines that an insured person who has incurred category I disability before the age of 21 is entitled to disability pension if he or she was compulsorily insured at the time of the disability or if he or she has completed at least three months of insurance period.

Article 43(2) of the ZPIZ-2 provides that an insured person who has acquired category I disability after the age of 21 but before the age of 30 acquires the right to disability pension on condition that he has completed, before the onset of the disability, a pension qualifying period covering at least one quarter of the years of work.

The general conditions for the entitlement to rights on the grounds of disability are laid down in Article 69 ZPIZ-2. This Article provides that, where not otherwise provided for in ZPIZ-2, an insured person shall acquire rights on the basis of disability of categories II and III if, at the time of the occurrence of the disability, he or she has not yet attained the age of 65 years and:

• is covered by compulsory insurance - irrespective of the length of the pension qualifying period;

• is not compulsorily insured – if he/she fulfils the conditions of insurance or pension qualifying period laid down in this Act for entitlement to disability pension.

Right to Occupational Rehabilitation

According to Article 70 of the ZPIZ-2 occupational rehabilitation is an integrated process in which an insured person is professionally, physically and psychosocially trained for another occupation or another job so that he or she can obtain appropriate employment and re-integrate into a work environment or is trained to perform the same occupation or job by adjusting his or her position with appropriate technical aids.

Article 72 of the ZPIZ-2 sets out that an insured person is entitled to occupational rehabilitation:

• who has incurred a category II disability but has not yet reached the age of 55 on the date the disability occurred and who, in the light of his/her remaining working capacity, can be trained for other full-time work.

• who has incurred a category II disability and has not attained the age of 50 years on the date the disability occurred and who, in the light of his/her residual capacity for work, can be trained for other work which he/she will be able to perform on a part-time basis, at least four hours a day.

According to Article 75 of the ZPIZ-2 occupational rehabilitation is carried out in accordance with the insured person's remaining work capacity as:

• short-term training and education;

• practical work in a suitable job with an employer or in other forms of occupational training;

• through in-service training with the consent of the insured person, who will be trained for other full-time work;

• education at appropriate schools and other forms of education.

Right To Reassignment

The right to reassignment is vested in the insured person:

After completion of occupational rehabilitation, if the insured person is able to work in another full-time job, and for which he/she has received training in the framework of occupational rehabilitation,

With remaining work capacity, who has acquired category II disability after reaching the age of 55 years;

Article 81(1) of the ZPIZ-2 provides that with category III disability if the insured person's capacity to work in his/her occupation is reduced by less than 50 % or if the insured person is still able to work full-time in his/her occupation but is unable to work in the job in which he/she is employed.

An insured person who has an employment relationship in Slovenia shall be granted the right to

reassignment by the employer (Article 81(2) ZPIZ-2).

Right to Work Part-Time

An insured person has the right to work part-time, at least four hours a day or 20 hours a week:

Who is classified as disabled under category III and is no longer able to work full-time;

Who has acquired category II disability after reaching the age of 55 and has the remaining capacity to perform the work he/she is doing or other work at least part-time;

According to Article 82 of the ZPIZ-2 having completed occupational rehabilitation, who has been trained for other work which he/she will perform on a part-time basis for at least four hours a day.

Article 83 of the ZPIZ-2 defines that a worker with a disability may be granted the right to occupational rehabilitation instead of the right to a reassignment or the right to part-time work of at least four hours a day if he or she so requests no later than the date of the hearing before the first-instance disability commission. In this case, he/she has all the rights under and in connection with occupational rehabilitation.

Right to A Disability Benefit (Allowance)

Article 85(1) of the ZPIZ-2 provides that an insured person who has been granted the right to be reassigned after completion of occupational rehabilitation and an insured person who has incurred a category II disability after the age of 55 or a category III disability if the insured person's capacity to work in his/her occupation is reduced by less than 50 % or if the insured person is still able to work in his/her occupation full-time but is unable to work in the job in which he/she is employed, shall be entitled to a disability benefit (allowance), provided that:

Upon the occurrence of the disability, he or she was not employed or covered by compulsory insurance, or

His or her employment was terminated on the basis of a favourable opinion of the commission establishing grounds for termination of the employment contract or independently of his or her own will, or through no fault of his or her own, or

He or she terminated his or her employment him- or herself or through his or her own fault, or

He or she has obtained another work post.

Right to A Partial Benefit (Allowance)

According to Article 86(1) of the ZPIZ-2 an insured person who has been granted the right to work part-time, at least four hours a day or 20 hours a week, is entitled to a partial allowance.

Article 88 of the ZPIZ-2 sets out that it can also be acquired by an insured person who was not compulsorily insured at the time of the disability and by an insured person who lost his/her job or, through no fault of his/her own, terminated his/her employment or compulsory insurance at the time of or after the disability, if he/she registers with the ZRSZ within 30 days after the final decision on the disability insurance claim is made or the employment or insurance relationship is terminated.

Assistance and Attendance Allowance

Article 100 of the ZPIZ-2 entitles insured persons who have entered into an employment relationship or have started to carry out an independent gainful activity as blind or partially sighted persons defined in group 2 of the definition of blindness, insured persons who become blind or partially sighted in the course of employment or self-employment, and non-sighted insured persons who are employed in a job commensurate with their working capacity, but at least half-time, provided that they are not entitled to an allowance for assistance and attendance on some other basis. Those persons shall retain the right to the allowance for assistance and attendance even after their employment has ceased if their employment has ceased through no fault of their own or if they have acquired the right to a pension. An insured person is considered to be immobile if he or she has a reduced mobility of at least 70 %.

The acquisition of this right is conditional on the person's statutory status and on an opinion of the ZRSZ disability commission, which establishes that the person in question requires the constant help and assistance of another person in order to carry out the basic necessities of life, or that he or she is a person who is entitled to this right under the law due to certain medical circumstances (Murgel, 2020; Žiher, 2015).

RESEARCH STUDY

Description Of The Research Methodology

This scientific article is based on a qualitative method aimed at understanding the needs of persons diagnosed with MS (Horvat Ledinek et al., 2019). The aim of the research is to discover the experiences of these persons over 18 years of age in the process of obtaining a disability status, which is why we conducted a survey with them. We used

several types of scientific research methods to provide different perspectives on the problem being studied. The descriptive method was used to define disability, the rights and legal status of people with disabilities and legal protection in Slovenia. We used a comparative method to determine whether people with the same or similar disabilities have the same rights and whether the status of disabled is recognised for persons diagnosed with MS. We summarised the findings, views and opinions of various authors in the field of disability using the compilation method. The abstraction and concretization methods were used to examine the literature and to determine whether persons with disabilities have difficulties in obtaining disability status and equal rights in relation to the same or similar disability. In conclusion, the article was formulated using the synthesis method, which was used to provide guidance to persons with MS on the exercise and realisation of their rights under existing legislation and to propose changes to the legislation on the acquisition of disability status.

Disability Status Of Persons Diagnosed With MS

MS is a chronic, autoimmune, inflammatory and demyelinating disease of the central nervous system. The aetiology of the disease is unknown, and it most commonly affects people between the ages of 20 and 40, with women more often than men. Geographical latitude, genetic factors, gender, age, race, viruses and migration all play a role in the development of the disease (Horvat Ledinek, 2014).

There are approximately 3000-3500 patients with MS in Slovenia, but there is currently no patient registry to record epidemiological data, the number of patients treated, the degree of functional impairment, and the efficacy and safety of medical treatment (RTV SLO, 2020).

With the development of medical science, the quality of life of MS patients is being prolonged, increasing the number of adult patients who are able to work. More and more patients are entering the active working population. Marija Šoštarič Podlesnik, specialist in neurology and Head of the Department of Neurology at Celje General Hospital, said: "Thanks to the availability and treatment with newer effective drugs, the disease today very often does not manifest itself in such a severe way and fewer patients develop severe impairments in the long term. We often see people who have been diagnosed for 20 years or more and can still lead an active life, function in family and social life, engage in sports." (Maribor info, 2022).

Methodology

In order to find out what the actual situation in Slovenia is, whether persons diagnosed with MS are recognised as having a disability and what rights they have, we conducted a survey with one hundred and seven such persons. The survey consisted of six questions, namely:

1. What is your EDSS score on a scale of 0 to 10?
2. What is your status (e.g., student, unemployed - jobseeker, full-time employee, part-time employee, inactive - retired)?
3. Have you applied for disability status, at what age and with which authority did you apply for disability status, and if so, under which statute?
4. How was your application dealt with, did you have problems proving your disability, did you seek legal redress?
5. What rights do you have on the basis of your disability (e.g., disability benefits, allowance for foreign assistance, attendance allowance, financial social assistance in cash, family assistant, EU Disabled Persons' Benefits Card, etc.)?
6. Please give us your opinion, feelings on your health and experience in claiming rights.

To determine the severity of MS, we asked about the degree of physical impairment, which is a good indicator of work capacity, although it is not the only determinant of work ability in persons diagnosed with MS, as it is an immune-dependent, chronic and inflammatory disease of the central nervous system, which remains incurable for the time being.

With regard to the assessment of physical impairment (TO) in patients with definite MS, expert neurologists take into account the degree of impairment according to the »Kurtzke Expanded Scale«, depending on the specific impairment of the individual patient. The basic scale in the assessment of impairment in people with MS is the Expanded Disability Status Scale (EDSS) (Zupanc et al., 2016).

Table 1. Professional Board of the Sector for Expertise 22. 3. 2022

EDSS	Assessment of TO
2,5	30 %
3,0–3,5	40 %
4,0–4,5	50 %
5,0	60 %
5,5	70 %
6,0	80 %
6,5	90%
7,0 or more	100 %

At 0 - 3.5, the impairments are considered mild, from 3.5 - 6, walking is affected, from 6 onwards, walking support (cane) is needed, at 7, walking support (wheelchair) is needed, at 8, the patient is bedridden, at 9, he/she cannot use his/her arms, at 10, death due to disease (U.S. Department of Veterans Affairs, 2021).

We were interested to know whether the persons had applied for disability status, at what age and by which authority, whether they had acquired disability status and, if so, under which statute. We also wanted to know whether they had difficulties in proving their disability and if so, whether they had recourse to the courts, what experience they had in claiming their rights, what rights they have on the basis of their disability, whether they are employed and if so, whether they have any workplace limitations (e.g., part-time work).

The data were collected through a survey carried out between October-January 2022 and March 2023. 107 patients, members of the MS Association of Slovenia, answered the questionnaires. The total number of completed surveys was 85.

RESULTS

Obtaining Disability Status

Based on the data obtained, we found that thirty-seven respondents had a physical impairment (TO) of up to 40%, twelve had a TO of 50% to 70%, twenty-five had a TO of 80% to 90%, and eleven had a TO of 100%; we did not include other medical information in the survey because we wanted to find out whether persons diagnosed with MS are recognised as having the same or similar disability status and have the same rights.

To 80% and over

Among the persons with TO 80% and above, two persons are still in full-time employment and have applied for disability status, while the remaining thirty-four persons have an officially established disability. Of these, thirty are retired with a disability pension under ZPIZ, two are unemployed and two are working part-time.

To from 50% to 70%

Two persons diagnosed with MS with a TO between 50% and 70% have not applied for disability status; they are jobseekers. Five persons are retired with a disability, three are employed part-time and two are seeking employment. Two persons have acquired disability status through ZZRZI, the others through ZPIZ-2.

To up to 40%

For persons with TO up to 40%, ten persons are in full-time employment and have not applied for disability status, thirteen persons are in part-time employment, nine persons are retired with a disability, four persons are unemployed, and one person has a student status. Of these, three persons have acquired the status of disabled person on the basis of ZZRZI. Twenty-two persons have acquired the status of disabled person under ZPIZ.

Rights Due To An Established Disability

Persons diagnosed with MS have different rights based on their established disability. The rights depend on the legal basis under which the persons claimed the disability status. If they claimed it under ZPIZ, they have a disability pension. If the person has claimed disability status under ZZRZI, they have no financial rights.

Six respondents receive financial social assistance, which is a social transfer intended to meet minimum subsistence needs and is not a right based on disability.

Persons diagnosed with MS, with a recognised impairment of at least 50%, who, at the time of the physical impairment, have completed the pension qualifying period for the right to a disability pension, irrespective of whether or not this impairment causes disability, and the condition of the predominance of insurance for a broader range of rights is met, are entitled to a disability allowance, but these persons have not received a disability allowance so far, because they were diagnosed with MS after 1.1.2013, and ZPIZ-2 did not provide for this possibility. ZPIZ-2J amendment of the law, which entered into force on 7.8.2021, amends the existing regime in such a way that insured persons may, as from the date of entry into force of this amendment of the law, acquire the right to a disability allowance for TO resulting from an illness or injury outside work.

Our survey shows that forty-six persons have an EU disability benefit card under Equalisation of Opportunities for Persons with Disabilities Act (ZIMI), while the rest have not applied or have not received an application because they do not have a decision granting disability status. Twenty respondents have a parking permit for disabled persons.

Employment And Work

Employment and MS

Work is an important value, reducing dependence on others and feelings of inferiority in both persons diagnosed with MS and the healthy population. Employment increases self-esteem, well-being and social interactions and reduces depression. Research shows that adults diagnosed with MS want or intend to work, but their chronic illness makes it difficult for them to achieve these goals. Fatigue, cognitive difficulties and mobility impairments are barriers to patients retaining employment (Files et al., 2015).

For persons diagnosed with MS, work not only affects social and economic aspects, but also their health and the progression of the disease. In fact, research has reported a deterioration in health as a result of work. Long-term studies are needed to monitor the impact of employment on changes in the health status of persons diagnosed with MS over the long term (Bishop & Rumrill, 2015).

In our study, ten people diagnosed with MS are employed full-time and thirteen part-time. All of these people have an EDSS of up to 3.5. There are also three part-time workers with an EDSS of 4, one with an EDSS of 6.5 and one with an EDSS of 8. There is one full-time worker with an EDSS of 6.5 and one with an EDSS of 7.

Twelve persons have not claimed disability insurance entitlements and have no recognised disability status.

Adjustment At Work

For persons diagnosed with MS, the work adjustment is part-time work, as shown by the survey. Fatigue, mobility and cognitive difficulties are the main factors that prevent people with MS from remaining in full-time employment. These symptoms affect their work differently depending on the demands and adaptability of the job, the possibility for sedentary work and flexible working hours and the impact on the content of the work (MSIF, 2016).

EDSS is one of the main predicators of reduced work ability, as also confirmed by our research (Ahlin Doljak, 2020).

Persons diagnosed with MS are physically less able to perform, which poses problems in employment. The progressive course of the disease, age, physical disability, increased levels of pain and fatigue, depression, anxiety and cognitive impairment are the most significant barriers to work ability (Persechino et al., 2022).

Our research shows that employees diagnosed with MS rarely have workplace adjustments, as out of thirty-three employees, only seven respondents have workplace adjustments. Two persons have a disability status under ZZRZI and the right to occupational rehabilitation. One person has already chosen an employer for employment after rehabilitation, while the other person is still looking for a suitable employer with the help of ZRSZ, with whom he/she could undergo on-the-job training and get a job.

Respondents' Opinions

Respondents who have claimed disability rights responded to the question "What is your opinion, feelings on your health and experience of claiming rights?" with the following answers:

Eleven persons stated that there is too much bureaucracy and constant proof of their medical condition to claim entitlements.

Twenty-six people said that there were no problems in claiming their rights and that the procedure under ZPIZ was carried out swiftly.

All of the disability pensioners said that the amount of the disability pension was too low, as they had retired with very little years of pensionable service.

Jobseekers are annoyed that they have to report to the ZRSZ every 6 months, even though they have not been offered or found a single job interview in all the time they have been jobseekers.

Conclusions

There is no single register of persons with disabilities in Slovenia because differentinstitutions grant disability status under different laws. There is no register in Slovenia of patients diagnosed with MS. The fragmentation of the legislation is described and illustrated is evident from the survey conducted among MS patients. If the disability commissions do not grant a person the status of a person with a disability under certain legislation, this does not mean that the person does not have a disability on the basis of the TO; it only means that he/she is not entitled to certain rights under the sectoral legislation.

The research shows that different commissions decide on the rights of persons with disabilities depending on the legal basis from which the right is derived, which is not appropriate as the work of the medical commissions is not uniform. It would be necessary to organise a single expert body, as persons with disabilities in Slovenia do not

have the same rights with the same or similar disabilities.

If the disability arises during employment and the condition of minimum pension qualifying period is met, the legal basis is ZPIZ-2.

If a person is registered as unemployed with ZRSZ and has reached the age of 15 or is not older than the minimum pension qualifying period under the pension and disability insurance regulation, the legal basis is ZZRZI.

The different legal statuses also give rise to different benefits for disabled persons. Disability benefits are not paid to disabled persons who are registered as unemployed with the ZRSZ and who have a disability status under ZZRZI. ZZRZI does not regulate minimum social security for persons who have acquired the status of a person with a disability under this law and are incapable of gainful employment.

ACKNOWLEDGMENT

The author would like to express his deepest gratitude to New University, Faculty od law, Slovenia as affiliates of the authors. Deep gratitude was also conveyed to all parties involved in this study.

Conflict of Interest

We declare that this article we wrote is not involved in any conflict of interest

Ethics Statement

The writing of this article has gone through all ethical procedures related to the academic realm. The study protocol was approved by the Ethics Committee of of ZMMS (Multiple Sclerosis Association of Slovenia) (Ethics Committee Approval: 2022/08-19), with special emphasis on informed consent vulnerability of the study population.

Author Contributions

Study Design, NW and SAD; Data Collection, NW and SAD; Statistical Analysis, NW and SAD; Data Interpretation, SAD; Manuscript Preparation, NW and SAD; Literature Search, NW and SAD. All authors have read and agreed to the published version of the manuscript.

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Zakon o socialnem vključevanju invalidov (ZSVI; Social Inclusion of Disabled Persons Act), Ur. l. RS, No. 30/18 et seq.

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LIST OF ABBREVIATIONS AND WORDS DEFINITIONS

ZDR-1 - Employment Relationships Act

ZOA - Personal Assistance Act

ZPIZ - Pension and Disability Insurance Act (Official Gazette of the Republic of Slovenia [Uradni list RS], No. 12/92 of 13 March 1992)

ZPIZ-1 - Pension and Disability Insurance Act (Official Gazette of the Republic of Slovenia [Uradni list RS], No. 106/99 of 10 December 1999)

ZPIZ-2 - Pension and Disability Insurance Act (Official Gazette of the Republic of Slovenia [Uradni list RS], No. 96/12 of 14 December 2012)

ZSVI - Social Inclusion of Disabled Persons Act

ZUTD - Labour Market Regulation Act

ZZRZI - Vocational Rehabilitation and Employment of Persons with Disabilities Act

ZIMI - Equalisation of Opportunities for Persons with Disabilities Act

Disability commission - The Pension and Disability Insurance Institute of Slovenia's expert bodies shall operate within the framework of first and second instance disability commissions

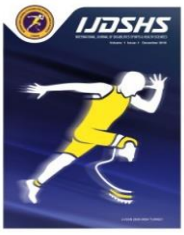
Rehabilitation commission - In the process of recognising the status of a disabled person under the Act on Occupational Rehabilitation and Employment of Disabled Persons and in the process of exercising the right to occupational rehabilitation, the Pension and Disability Insurance Institute must obtain the opinion of the Rehabilitation Commission.

Medical commission - If the insured person or the employer disagrees with the decision of the appointed physician of the Health Insurance Institute of Slovenia (ZZZS), they may lodge an appeal with the appointed physician of the ZZZS who issued the decision within 5 working days of receiving the decision. The appeal will be handled by the healthcare commission of the ZZZS

Decision on disability - Decision on disability refers to an official determination made by a competent authority regarding an individual's disability status. This decision typically involves assessing the extent of a person's impairment or incapacity and may entitle them to certain benefits, accommodations, or support services.

Final decision – Final decision refers to a legally binding determination made by a competent authority regarding the level of disability of the worker. This decision is not subject to further appeal or review and represents the conclusive assessment of the individual's disability status. It signifies that all nec-essary evaluations, assessments, and administrative procedures related to determining the worker's disability category have been completed, resulting in a definitive ruling.

Social enterprise - The companies paying salaries must calculate and pay advance income tax and social security contributions from the paid incomes.



International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

RESEARCH ARTICLE

Effect of Spinal and Lower limb Re-alignment Protocol on Bilateral Medial Compartment Osteoarthritis of Knee in Postmenopausal Women

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Abstract
The alignment of spine-pelvis-lower extremity axis is significantly influenced by knee osteoarthritis. Joint alignment is the main bio-mechanical risk factor for progression of knee osteoarthritis. The purpose of this study was to find out the effect of spinal and lower limb realignment protocol on bilateral medial compartment knee osteoarthritis in postmenopausal women and to compare it with the conventional method of treatment for osteoarthritis of knee. A study sample of 128 post-menopausal subjects within age group 50-70 and BMI between 25-35 kg/m^2 having bilateral knee osteoarthritis with medial compartment involvement were selected and equally divided into two groups as the control group and the experimental group. Assessment of pain, knee range of motion, quadriceps and hip abductor strength, and posture for spinal and lower limb malalignment was taken before and after giving the treatment regime to both the groups. Comparison was carried out between the results of the two groups.The results showed how significantly the mal-aligned structures were re-aligned after giving 8 weeks of realignment protocol and how significantly this resulted in better reduction of pain intensity and improvement in knee range of motion and strength of quadriceps and hip abductor muscles in experimental group as compared to the control group. Re-aligning the spinal and lower limb malalignment present in postmenopausal women with bilateral medial compartment knee osteoarthritis results in pain reduction associated with knee joint and improved knee range of motion and strength of quadriceps and hip abductor muscles in these individuals as compared to the ones receiving conventional physiotherapy.

Keywords
Knee-Hip-Spine Syndrome, Genu Varum Malalignment, Realignment Exercises

INTRODUCTION

Osteoarthritis is a progressive degenerative joint disorder that causes destruction of the articular cartilage and results in the development of bony spurs and cysts at the margins of the joint. It is one of the leading causes of disability. Knee osteoarthritis (OA) is the most commonly encountered type leading to pain of muscle-skeleton and disability in the elderly. Patients generally complain about pain, muscle weakness, joint stiffness, instability and decrease in physical functions (Yilmaz et al., 2013).

Knee osteoarthritis is one of the most prevalent forms of this disease,with the medial compartment most commonly affected with lateral compartment and patello-femoral joint being relatively spared. This is because medial compartment experiences greater force during bipedal activities such as walking and running. A study shows prevalence of medial compartment involvement was 91.7% while that of lateral compartment and patellofemoral joint was 32.1% and 33.9% respectively (Wang et al., 2018).

Prevalence of knee osteoarthritis is higher in women as compared to men. Evidence suggests that

Received: 04 December 2023 ; **Revised** ; 25 March 2024 ; **Accepted:** 02 May 2024; **Published:** 25 May 2024

How to cite this article: Agarwal, K., Mishra, S., and Shinde S. (2024). Effect of Spinal and Lower limb Re-alignment Protocol on Bilateral Medial Compartment Osteoarthritis of Knee in Postmenopausal Women . *Int J Disabil Sports Health Sci*;7(3):527-540.https://doi.org/10.33438/ijdshs.1399844

women's susceptibility to osteoarthritis may be related to increased hormone levels during certain stages of the menstrual cycle which may increase joint laxity, which is associated with joint instability and injury (Chidi-Ogbolu & Baar, 2019; Jin et al., 2017; Shultz et al., 2005). Both joint instability and injury contributes to the development of osteoarthritis. Incidence of knee osteoarthritis increases in menopause with reduction in oestrogen levels being the main cause (Fenton & Panay, 2016). Oestrogen has an anti-inflammatory effect at high concentrations and plays a chondroprotective role (Martin-Millan & Castaneda, 2013). At the same time, those women who undergo hormone replacement therapy after their menopause have a lower possibility of developing osteoarthritis.

The sagittal alignment of spine-pelvis-lower extremity axis is significantly influenced by knee osteoarthritis (Wang et al., 2016). Study shows that individuals over 50 years of age with knee osteoarthritis had poor spino-pelvic sagittal alignment. Moreover, the progression of knee osteoarthritis had stronger relationship with spino-pelvic malalignment more in women than in men (Yasuda et al., 2020). The increased spinal inclination angle is the most important factor associated with knee osteoarthritis, followed by decreased spinal range of motion (Tauchi et al., 2015). Decreased lumbar lordosis and lumbar range of motion is related to increased spinal inclination angle. There is reduction in hip, knee and ankle range of motion, and increased hip adduction and knee adduction moment. Weakness of quadriceps and hip abductors is common. In severe cases varus deformity sets in at the knee joint. The main bio-mechanical risk factor for progression of knee osteoarthritis is joint malalignment.

Osteoarthritis is a progressive and degenerative condition with unlikely regression and restoration of damaged structures seen.

Studies show that almost all clinical practice guidelines focus on non-pharmacological conservative treatment approaches particularly exercise therapy for the management of knee osteoarthritis (Bannuru et al., 2019; Fernandes et al., 2013; McGrory et al., 2016).

The current management focuses on reducing pain intensity, improving range of motion, strengthening the weakened structures and improving quality of life. To achieve this, various electrotherapeutic modalities like transcutaneous electrical nerve stimulation and ultrasound are used, along with this aerobic training, strength training, stretching and balance training is given to the patients. A study was done that shows effectiveness of quadriceps strengthening for treatment of knee osteoarthritis (Bennell et al., 2010). Another study found that hip abductor exercises combined with quadriceps exercises reduces pain and improves function (Yuenyongviwat et al., 2020). Aquatic therapy that is water-based treatment is an alternative approach for patients who find it difficult to perform land-based exercises given the lesser joint impact.

There has been no focus done on managing the biomechanical factors such as malalignment that affects osteoarthritis and its progression. Hence, re-alignment of spinal and lower limb mal-aligned structures by setting appropriate treatment protocol is essential and may help in delaying the progression of bilateral medial compartment osteoarthritis in postmenopausal females.

MATERIALS AND METHODS

Study Group

All postmenopausal females within age group 50-70 and BMI between 25-35 kg/m^2 with bilateral knee osteoarthritis involving the medial compartment were called to participate in the study. They were then assessed for the presence of spinal and lower limb malalignment. Then females who had spinal and/or lower limb malalignment were selected as the study sample. Inclusion criteria were as follows: 1. Postmenopausal females; 2. Bilateral knee osteoarthritis; 3. Involvement of medial compartment of knee; 4. Presence of spinal and lower limb malalignment. Volunteers who met the following criteria were excluded form the study: 1. Unilateral knee osteoarthritis; 2.Involvement of compartment other than medial compartment.

Subjects were then randomly assigned into two groups that is experimental group (n=64) and control group (n=64). While the control group received conventional treatment protocol for management of bilateral medial compartment knee osteoarthritis the experimental group received spinal and lower limb re-alignment protocol based on the malalignment present in subjects along with the conventional treatment.

Ethics Statement

This interventional study was accepted by Institutional Human Ethics Committee of

Krishna Institute of Medical Sciences, "Deemed to be University," Karad (Protocol number-296/2022-2023).

Data Collection Tools

Numerical Pain Rating Scale (NPRS)

It is one of the most common and most sensitive methods of pain measurement was used. Reliability of this scale for patients who experience pain from a musculoskeletal disorder has been proven excellent (Seidi et al., 2014)

Goniometer.

Goniometer can help in clinical decision making regarding the management, outcome analysis after a particular intervention has been applied, and compare the efficacies of different treatments. According to a study measuring a joint angle with a universal goniometer has moderate to excellent reliability (Norkin &White , 2016)

Manual Muscle Testing(MMT)

Manual Muscle Testing is most commonly used method for documenting impairments in muscle strength.On 5 point scale,the examiner rates the studied muscle as subjectively "weak"or"strong"when exerting force against the subject's resistance

Observational Posture Analysis

It provides valuable insights into spinal alignment, pelvic position, and other body segments,it also allows to identify postural deviations and develop targeted treatment plans.

Experimental design

The screening process of the subjects as per the inclusion and exclusion criteria was done and The subjects were divided into 2 groups i.e the control and experimental group. Prior to the initiation of the study the participants were briefed about the nature of the study and the intervention as well as the testing procedures . The informed consent was obtained from the participants who are willing to participate and were recruited for the study. All the subjects were assessed pre and post treatment . For degree of pain, Numerical Pain Rating Scale (NPRS) was used. Range of motion for knee was assessed using a goniometer. Manual Muscle Testing was used to assess the strength of quadricep muscles and hip abductors. This was followed by assessment of posture in all the three views that is the anterior view, posterior view and the lateral view. From this presence of spinal and lower limb malalignment like thoracic kyphosis, lumbar lordosis, anterior pelvic tilt, level of PSIS (Posterior Superior Illiac Spine), pronated foot, genu varum, hyperextended knee, tibial rotation and femoral torsion were noted in the selected subjects.Rehabilitation exercise program was administered for 12 weeks and during the withdrawal phase of the program the participants were given a brief instruction about the maintenance program of the home exercises. Both the groups were treated with Hot Moist pack before the treatment.

Group A: Spinal and lower limb re-alignment protocol

Group B: Conventional Physiotherapy

Spinal And Lower Limb Re-Alignment Protocol

The exercise program for each alignment changes were designed according to the condition; the exercise program was carried out for 12 weeks.

During the 12-week intervention period, participants were prescribed a comprehensive exercise protocol aimed at re-alignment of spinal and lower limb mal-aligned structures, delaying the progression of unilateral medial compartment osteoarthritis as well as improving knee function. As part of the intervention, participants were advised to utilize a knee unloading brace and lateral wedge insole (Page et al., 2011). The knee unloading brace, designed change the force around the knee joint to alleviate knee joint stress and pain, was custom-fitted to each participant and recommended to be worn during exercise sessions and daily activities. Additionally, participants were provided with lateral wedge insoles, intended to modify biomechanics and reduce knee discomfort; these insoles were recommended for wear in participants' footwear throughout the intervention period. Detailed instructions regarding the correct usage, duration, and maintenance of both the knee unloading brace and lateral wedge insole were provided to ensure proper implementation. Compliance with the intervention strategies was monitored through regular check-ins and participant feedback.

The intervention is discussed in detail in the folllowing tables.

Table 1. Thoracic Kyphosis (Oshima et al., 2019, Brotzman & Manske , 2011)

Exercises	Intensity/Sets
Session 1-	
Day 1- Day 5	
Flexibility-Pectoral major stretch,Thoracic extension exercise	3 sets-15 repetitions-10 seconds hold
Strength-Shoulder Shrugs	10 repetitions-10 sets
Mobility-Chin Tucks	10 repetitions -5 seconds hold
Day 6-Day 10	
Flexibility-Foam roll stretch(touchdown), Foam roll stretch(pectoralis major and subscapularis)	10 repetitions-10 seconds hold
Mobility-Arm circles,shoulder blade squeeze	10 repetitions-10 sets
Session 2-	
Week 3-5	
Strength-Seated Rowing,Pushups,Lateral pulldown	10 repetitions-3 sets
Mobility-Prone Y,T,W exercises	10 repetitions-2sets
Week 9-12	
Strength-Dumbell Rowing	10 repetitions-3 sets
Flexibility-Face pull with theratube,Dyanamic thoracic extension exercises with lunges	10 repetitions-3 sets
Endurance-Planks,Deadbug exercise	3sets-5 repetitions-30 seconds hold
Progression criteria:- - Decreased pain levels during activities of daily living. - Improved thoracic mobility and range of motion. - Increased strength in thoracic extensors and scapular stabilizers. - Enhanced posture awareness and maintenance. - Gradual reduction in thoracic kyphosis angle through postural assessments	

Table 2. Lumbar Lordosis (Javid et al., 2014 ; McGill, 2015 ; Kisner et al., 2017)

Exercises	Intensity/Sets
Session 1-	
Day 1- Day 5	
Flexibility-Seated lumbar flexion -extension	10 repetitions -5 seconds hold
Strength-Pelvic tilt,Drawing in maneuver,Lumbar isometrics	10 repetitions -5 seconds hold
Week 2	
Flexibility-Cat-Cow stretch,Child pose	10 repetitions-5sets-10 seconds hold
Mobility-Single Knee to chest	hold for 5-10 seconds-3 Sets
Strength-Drawing in maneuver	10 repetitions -5 seconds hold
Session 2	
Week3-4	
Flexibility-Hip flexor stretch,Hamstring stretch	5 to 10 seconds holds-10 repetitions
Strength-Double knee to chest,Partial sit-up,Bridging exercise,Dead Bug exercises	10 repetitions-5 sets
Week 5-6	
Flexibility-Pigeon pose stretch	5 to 10 seconds holds-10 repetitions
Strength-Modified plank with variations,Dead-bug with ball squeeze,Standing quadriceps stretch with hip extension	5 to 10 seconds holds-10 repetitions
Session 3-	
Week 7-8	
Strength-Swiss ball roll outs,Squats,Lunges with controlled lumbar posture	10 repetitions-5 sets
Mobility-Bird Dog exercises	15 seconds hold-10 repetitions
Endurance-Modified curl-up,Seated Russian twists with medicine ball	10 repetitions-5sets
Week 9-12	
Flexibility-Standing trunk rotations with resistance band	10 repetitions-5sets

Strength-Side plank with with lateral hip abduction,Bosu ball squats with overhead reach	20 seconds hold-10 repetitions
Balance-Weight shifts to multiple direction on single leg standing,Single leg standing on balance board	10 repetitions-5sets
Progression criteria- - Decreased pain levels during activities of daily living. - Improved lumbar mobility and range of motion. - Enhanced core strength and stability. - Enhanced awareness of posture and its impact on lumbar lordosis. - Gradual reduction in excessive lumbar lordotic curve through postural assessments.	

Table 3. Anterior Pelvic Tilt (Sahrmann 2002; Selkowitz et al., 2013;Kuszewski et al., 2018; Kadav et al. 2023)

Exercises	Intensity / sets
Session 1-	
Week 1-2	
Flexibility-Iliotibial stretch,Tensor fascia lata stretch,Hip flexor stretch,Hamstring stretch,Hip adductor stretch,Quadriceps stretch	10-20 seconds hold-3 repetitions
Strength-Drawing in maneuver	10 repetitions-3 sets
Endurance-Gluteus bridging	10 repetitions-3 sets
Session 2-	
Week 3-4 (Continue with all the stretches**)**	
Strength-Clamshell exercise,Single leg gluteus bridging,Dead bug	10 repetitions-3 sets
Mobility-Bird dog exercise,Cat cow exercise	10 repetitions-3 sets
Week 5-6	
Strength-Quadruped hip extension,Resistance band lateral walk,Bent knee fallout	10 repetitions-3 sets
Endurance-Plank with alternate leg lift	10 repetitions-3 sets
Session 3-	
Week 7-12	
Strength-Step-ups,Resistance band around ankle walk ,Supine Bridging exercise(progression ladder pattern),Seated Russian twists ,Lateral lunges with rotation	10 repetitions-3 sets
Progression criteria: - -Improved pelvic alignment and reduced anterior pelvic tilt. -Enhanced hip flexibility and hamstring length. -Increased gluteus and core muscle strength. -Decreased discomfort or pain associated with anterior pelvic tilt. -Enhanced awareness of pelvic alignment during functional tasks.	

Table 4. Pronated Foot (Anderson et al., 2004 ; Moon et al., 2014; Pabón-Carrasco et al. 2020; Sawant & Shinde, 2021)

Exercises	Intensity/Sets
Session 1-	
Week 1-2	
Flexibility-Eccenteric calf stretch,Short foot exercises with toe spread	15repetitions-3 sets
Strength-Calf raise	15repetitions-3 sets
Mobility-Foot mobility exercises	15repetitions-3 sets
Session 2-	
Week 3-4	
Strength-Toe spreading and gripping exercise ,Seated Arch lifts	15repetitions-3 sets
Mobility-Ankle Alphabet,Marble pickup	15repetitions-3 sets
Week 5-6	
Flexibility-Towel scrunch	10 repetitions-3 sets
Strength-Resistance foot flexion and extension,Toe curls with resistance bands	10 repetitions-3 sets

Mobility-Tripod push	10 repetitions-3 sets
Session 3-	
Week 7-8	
Balance and stability-Single-leg balance with eyes closed	10 repetitions-3 sets
Strength-Resistance band ankle exercise,Calf raises with eccentric control	10 repetitions-3 sets
Mobility-Dynamic foot workouts	10 repetitions-3 sets
Week 9-12	
Balance and stability-Balance board exercises	10 repetitions-3 sets
Strength-Intrinsic foot muscle activation during squats,Calf raises on unstable surface,Ankle resistance bands inversion and eversion	10 repetitions-3 sets
Progression criteria- -Improved foot alignment and reduced pronation during static and dynamic activities. -Increased intrinsic foot muscle strength and arch support. -Enhanced ankle stability and proprioception. -Decreased discomfort or pain associated with pronation. -Enhanced ability to perform functional movements with proper foot control.	

Table 5. Genu Varum (Kang et al., 2009; Han et al., 2011; Kwon et al., 2013; Moon et al., 2022)

Exercises	**Intensity/Sets**
Session 1-	
Week 1-4	
Flexibility-Hamstring stretch,Quadriceps stretch,Iliotibial band stretch,Wall calf stretch with knee alignment awareness	1 min hold/2 set
Strength-Isometrics -quadriceps,Seated hip abduction with resistance band	10 repetitions-3 sets
Mobility-Joint rotation exercises	10 minutes
Session 2-	
Week 5-Week 8	
Flexibility-Foam roller- Tibialis anterior,Anterior capsular ligament Stretch,Tensor fascia latae Stretch,Illiopsoas Stretch,Hamstring Stretch with progression,Adductor stretch with progression	1 min hold/2 set
Strength-Pelvic stretch,Squats,Abductor/External rotator,Kick back exercise	15 times-3 sets
Mobility-Joint rotation exercises	10 minutes
Session 3	
Week 9-12	
Strength-Side-Lying Leg Lifts with Hip Abduction,Calf Raises with Resistance Band,Leg extension quadriceps,Wall bar squat.	3sets 15reps
Endurance-Wall Squats with Ball Squeeze,Forward and backward stepping,Step ups and step down	3sets 20reps
Balance and stability-Balance board exercise	3sets 20reps
Progression criteria -Improved knee alignment and reduced genu varum during static and dynamic activities. -Increased strength in hip abductors, quadriceps, and calf muscles. -Enhanced stability and proprioception of the lower extremities. -Decreased discomfort or pain associated with genu varum. -Enhanced ability to perform functional movements with proper knee alignment.	

Table 6. Hyperextended Knee (Hubley-Kozey et al., 2006 ; Shelborne et al., 2007)

Exercises	Intensity/Sets
Session 1-	
Week 1-Week 4	
Flexibility-Quadriceps stretch,Hamstring Stretch with Knee Slight Bend,Hip abductor stretch,Hip adductor stretch,Calf stretch	10 seconds hold-3 repetition
Strength-Static quadriceps activation.,Seated knee rotation with ball squeeze	10 repitions-3 sets
Session 2-	
Week 5-Week 8	
Strength-Step-up with controlled descent,Prone hamstring curls,Terminal Knee Extension with Resistance Band,Prone Hamstring Curl with Resistance Band,Step-Up and Knee Raise	10 repitions-3 sets
Session 3	
Week 9-Week 12	
Strength-Wall Sit with Ball Squeeze	10 repetitions-3 sets
Balance and stability-Bosu Ball Squats	10 repetitions-3 sets
Endurance-Box Jumps with Controlled Landing	10 repetitions-3 sets
Progression Criteria: - Reduced knee hyperextension during static and dynamic activities. Improved muscle activation patterns for knee stability. Increased strength in quadriceps and hamstring muscles. Enhanced knee control during functional movements. Decreased discomfort or pain associated with knee hyperextension.	

Table 7. Tıbial Rotation (Homan et al., 2013 ; Kenji et al. 2018)

Exercises	Intensity/Sets
Session 1-	
Week 1-Week 4	
Flexibility- Tensor fascia latae stretch, seated hip internal rotation stretch, supine hip external rotation stretch, seated ankle rotation,internal tibial rotation with towel	10 seconds hold-3 repetitions
Strength- Internal tibial rotation with towel	10 repetitions 3 sets
Session 2-	
Week 4-Week 8	
Strength- Strength-Side lying leg lift with resistance band, resistance band stepouts, seated hip internal rotation with ball Squeeze Resistance- Active tibial rotation with resistance band, leg press With internal rotation of tibia	10 repetitions 3 sets
Session 3-	
Week 9-Week 12.	
Flexibility-Single leg squats, step ups,	10 repetitions 3 sets
Balance and stability- single leg balance with External pertubations, single leg balance with med ball throws.	10 repetitions 3 sets
Resistance – leg press with internal rotation of tibi	10 repetitions 3 sets
Progression Criteria: Improved tibial alignment during static and dynamic activities. Enhanced muscle activation patterns for knee stability and alignment. Increased strength in hip external and internal rotators. Enhanced tibial control during functional movements. Decreased discomfort or deviations related to tibial rotation	

Table 8. Femoral Torsion (Gaudreault et al., 2011)

Exercises	Intensity/Sets
Session 1-	
Week 1-Week 4	
Flexibility-Stretching of iliotibial band,Piriformis Stretch	10 seconds hold-3 repetitions
Strength-Isometric quadriceps contraction,Short Arc Quadriceps Contraction,Supine Hip External Rotation	10 repetitions 3 sets
Session 2-	
Week 4-Week 8	
Strength-Clamshell Exercise ,Isometric Hip External Rotation with Ball Squeeze,Side-Lying Leg Lift with Increased Resistance,Bridging with Hip External Rotation and Leg Lift	10 repetitions 3 sets
Session 3-	
Week 9-Week 12.	
Strength-Multi-Directional Cone Drills,Single-Leg Stability Ball Exercises.	10 repetitions 3 sets
Balance and stability-Single-Leg Bosu Ball Squats,	10 repetitions 3 sets
Endurance-Resisted Lateral Bounds	10 repetitions 3 sets
Progression Criteria: Improved femoral alignment during static and dynamic activities. Enhanced muscle activation patterns for knee stability and alignment. Increased strength in hip external rotators. Enhanced femoral control during functional movements. Decreased discomfort or deviations related to femoral torsion.	

RESULTS

Paired t-test was used to analyse the effect of re-alignment protocol on bilateral medial compartment knee osteoarthritis in postmenopausal females. Statistical analyses were performed using SPSS Software 23.0.Arithmetic mean, standard deviation, p value were calculated from the data. Table 1 Demonstrates the effectiveness of physiotherapy intervention on spinal and lower limb realignment.

Thoracic kyphosis :

The mean value from the experimental group show a decrease from pre-interventional assessment (0.4694) to post interventional assessment (0.2041),indicating improvement in thoracic kyphosis. The p-value (0.0004) indicates a statistically significant difference between pre and post-interventional assessments,demonstrating the effectiveness of the exercises in reducing thoracic kyphosis.

Lumbar lordosis. The p-value(0.0008) suggests a statistically significant difference between pre and post-interventional assessments,indicating that the exercises had a positive impact on lumbar lordosis

Anterior Pelvic Tilt. The obtained p-value of 0.0019 indicates a statistically significant distinction between the pre- and post-interventional assessments. This demonstrates strong evidence that the exercises had a beneficial impact in reducing anterior pelvic tilt. Pronated foot. The p-value (<0.0001) suggests a statistically significant difference between pre- and post-interventional assessments, indicating the effectiveness of the exercises in reducing pronated foot.

Genu varum:

The p-value (0.011) suggests a statistically significant difference between pre- and post-interventional assessments, indicating that the exercises had a positive effect on genu varum.

Hyperextended knee:The p-value (0.0016) suggests a statistically significant difference between pre- and post-interventional assessments, indicating that the exercises were effective in reducing hyperextended knee.

Tibial rotation:

The p-value (0.0068) suggests a statistically significant difference between pre- and post-interventional assessments, indicating the impact of the exercises on tibial rotation.

Femoral torsion:

The p-value (0.0324) suggests a statistically significant difference between pre- and post-interventional assessments, indicating that the

exercises had a positive impact on femoral torsion. Based on the results, the exercises targeting spinal and lower limb alignment showed positive effects in reducing thoracic kyphosis, lumbar lordosis, scoliosis, anterior pelvic tilt,pronated foot, genu varum, hyperextended knee, tibial rotation, and femoral torsion in the experimental group compared to the control group. Regarding hip abductors strength, the obtained p-value of 0.0068 signifies a statistically significant difference between the pre- and post-interventional assessments. This suggests that the exercises had a notable positive effect on enhancing hip abductors strength in both the experimental and control group.

Table 2 demonstrates results of paired t-test in experimental group .The obtained p-value of less than 0.0001 indicates a highly statistically significant distinction between the pre- and post-interventional assessments for pain levels. This strong evidence suggests that the exercises were remarkably effective in reducing pain in both the experimental and control groups.Similarly, for range of motion, the obtained p-value of less than 0.0001 reveals a highly statistically significant difference between the pre- and post-interventional assessments. This significant finding indicates that the exercises had a substantial positive impact on improving the range of motion in both groups.For quadriceps strength, the obtained p-value of 0.0019 signifies a statistically significant difference between the pre and post interventional assessments. This suggests that the exercises yielded a noteworthy improvement in quadriceps strength for both the experimental and control groups.

Table 1. Effect of exercises of spinal and lower limb alignment pre and post of both experimental and control group (paired t test was used.)

	Control Group		**Experimental Group**	
	Pre interventional assessment	Post-interventional assessment	Pre - interventional assessment	Post-interventional assessment
THORACIC KYPHOSIS				
Mean (M) ± Standard Deviation(SD)	0.3878 ± 0.4923	0.3469± 0.4809	0.4694± 0.5042	0.2041± 0.4072
p value =		0.6594		0.0004
LUMBAR LORDOSIS				
M ± SD	0.449 ± 0.5025	0.3878 ± 0.4923	0.5306 ± 0.5042	0.2857 ± 0.4564
p value =		0.4725		0.0008
ANTERIOR PELVIC TILT				
M ± SD	0.3265 ±0.4738	0.2857±0.4564	0.4286±0.5	0.2449±0.4345
p value =		0.6594		0.0019
PRONATED FOOT				
M ± SD	0.3878±0.4923	0.3673±0.4871	0.4694±0.5042	0.1429±0.3536
p value =	0.8298			<0.0001
GENU VARUM				
M ± SD	0.3469±0.4809	0.3265±0.4738	0.4286±0.5	0.2449±0.4345
p value =		0.8112		0.011
HYPEREXTENDED KNEE				
M ± SD	0.5714±	0.5918±	0.449±	0.2245±
p value =		0.8212		0.0016
TIBIAL ROTATION				
M ± SD	0.4082	0.3878	0.5102	0.3673
p value =		0.3223		0.0068
FEMORAL TORSION				
M ± SD	0.3878	0.3673	0.4694	0.3469
p VALUE =	0.7993		0.0324	

Table 2. Effect of exercises on the coutcome measures pre and post of both the interventional and control group. (paired t test was used.)

	CONTROL GROUP		EXPERIMENTAL GROUP	
	Pre-interventional assessment	Post-interventional assessment	Pre-interventional assessment	Post-interventional assessment
PAIN				
M ± SD	8.122±1.201	4.735±1.151	7.939± 1.248	2.714± 1.173
p VALUE	<0.0001		<0.0001	
RANGE OF MOTION				
M ± SD	92.735± 9.617	108.43± 8.147	90.918± 9.893	135.27± 8.482
p VALUE	< 0.0001		<0.0001	
QUADRICEPS STRENGTH				
M ± SD	3.592±0.4966	3.776±0.4216	3.49±0.5051	4.531±0.5042
P VALUE	0.0019		<0.0001	
HIP ABDUCTORS STRENGTH				
M ± SD	3.531±0.5042	3.673±0.4738	3.633±0.6355	4.061±0.5919
p VALUE	0.0068		0.0011	

DISCUSSION

This study was conducted to evaluate the effectiveness of re-aligning the spinal and lower limb mal-alignment present in bilateral medial compartment knee osteoarthritic females, in reducing symptoms of knee osteoarthritis. 128 participants were included based on the inclusion criteria and the outcome measures ie: pain, range of motion, quadriceps strength, hip abductors and postural analysis was assessed pre and post intervention and spinal realignment exercises. The results show that 8 weeks of realignment protocol was not only effective in correcting the malalignment but also was very effective in reducing pain symptom. Pain reduction in experimental group was much better than control group. There was also greater improvement seen in knee range of motion and strength of quadricep and hip abductor muscles in experimental group individuals than control group individuals who received only conventional treatment.

According to Norkin, musculoskeletal structures are interconnected. Knee-hip-spine syndrome is referred to as pathologies of these structures. Thus, when any of these structure is treated its effect is seen on the entire body (Norkin & White , 2016).

Another study conducted in Nanjing University Medical School, Nanjing, China shows that severe knee osteoarthritis have a significant influence on sagittal alignment of spine-pelvis-lower extremity axis (Wang et al., 2016). A study also demonstrated relationship between total spinal factors and occurrence of radiographic knee osteoarthritis in elderly subjects (Tauchi et al., 2015). There had been various studies done,that show how spine and lower limb alignment affects osteoarthritis of the knee joint, but there is no study done that demonstrates the effectiveness of treating those malalignments on knee osteoarthritis, hence this study was carried out. Various studies have been done on truncal alterations in people with severe osteoarthritis of the knee. According to Weng J, individuals with severe knee osteoarthritis had a more forward inclination of the global spine and increased hip and knee flexion. In individuals with minimal knee flexion (Fi < 10°), the lumbar spine appeared to be the main source of compensation for sagittal alignment issues. However, the spine, pelvis, and hip joint were all implicated in compensating in individuals with excessive knee flexion (Fi > 10°), resulting in a forward-inclined spine and pelvis and a flexed hip joint (Weng et al., 2015).

A study done by Bhore; P stated that multicomponent exercise program had a beneficial impact on alleviating pain. This was achieved by incorporating isometric exercises that targeted muscles crucial for the knee joint (quadriceps, hamstrings, and adductors) and core muscles (abdominals and lower back). These exercises activated the muscles and influenced the Golgi

tendon reflex mechanism. When muscles contract, sensory nerves transmit impulses to an excitatory synapse. Subsequently, an inhibitory synapse is activated through an inhibitory interneuron. This leads to an impulse being relayed back to the muscle through a motor nerve as the muscle relaxes. In simpler terms, these exercises helped activate and relax muscles, contributing to pain reduction (Bhore & Shinde, 2023). The exercise protocol used in this study for improving lordosis (Table 2) showed positive results, In few other studies improvement of back flexion strengthening with flexion exercises is advised as the efficient technique to revise individuals with spinal abnormalities since the primary supporting muscles of the spine are flexors (Walker et al., 1987 ; Li et. al., 1996). According to Woon Gyu Yoo individual strengthening exercise for anterior pelvic tilt resulted in recovery of pelvic tilt to a normal range (Yoo, 2013) and previous studies supports the theory of effectiveness of core muscle coordination training which increased the anterior pelvic tilt who had passive hamstring stiffness (Kuszewski et al., 2018) and similar results were observed in the experimental group (Table 3) of present study

The osteoarthritic knee joint deformity causes altered gaits and weak hip muscles. As a result, individuals with knee OA experience maladaptive kinematic stresses and loads during posture and walking, which leads to morphological alterations in the trunk in the sagittal, frontal, and transverse planes in addition to the lower extremities (Weng et al., 2015). The contracture and varus-valgus deformity of the osteoarthritic knee leading to compensatory mechanism may be the cause of the findings of increased scoliosis, apical deviation of the spine, and greater obliquity of the pelvis (Murray& Azari , 2015).

Genu varum, a common lower-extremity malalignment, can present challenges, especially in middle-aged postmenopausal women. This specific demographic, often characterized by muscle weakness and reduced bone density, may experience a rapid progression of genu varum. This progression can result in various issues, such as pain, diminished functionality, and an overall reduction in the quality of life (Lee & Park , 2016) It is crucial to address these concerns promptly and implement appropriate interventions to improve the overall well-being and mobility of affected individuals. Study done by Hyung-Hoon, Moon addressed muscle imbalance resulting from genu varum through a variety of exercises. They hypothesized that these exercises enhanced static stability and strength in the pelvis and lower extremities, ameliorated muscle imbalances, possibly by strengthening major lower extremity muscles (quadriceps femoris and rectus femoris) with resistance training, and notably reduced knee pain during body movements by balancing dynamic load within the knee joint.Genu varum malalignment of the knee may lead to compensatory foot pronation to enable the foot to be plantigrade when weightbearing.

Genu varum malalignment, can cause compensatory foot pronation as a means to achieve a plantigrade foot position during weightbearing (Riegger-Krugh & Keysor ,1996) short foot exercises increased the muscle activity of the abductor hallucis and the medial longitudinal arch angle during toe curl and short foot exercises. In this study tailor made protocol was given for Genu varum (Table 5) as well as pronated foot (Table 4) and improvement was observed in the results.

The clinical application of the designed spinal and lower limb realignment protocol presented in this research article holds significant promise for the management of bilateral medial compartment knee osteoarthritis in postmenopausal women. The study's findings suggest that the intervention, which focuses on correcting malalignments and improving alignment-related parameters, has the potential to alleviate pain, enhance knee range of motion, increase quadriceps and hip abductor strength, and enhancement of overall postural alignment. Collectively enhancing the functional capacity and overall quality of life of individuals suffering from osteoarthritis. The observed improvements in thoracic kyphosis (Table 1), lumbar lordosis,anterior pelvic tilt, pronated foot, genu varum, hyperextended knee (Table 6), tibial rotation (Table 7), and femoral torsion (Table 8) are indicative of the effectiveness of the realignment exercises in addressing various structural deviations associated with knee osteoarthritis. These changes are important not only for the immediate symptom relief but also for potentially slowing down the progression of the condition by minimizing aberrant biomechanical forces on the knee joint.

Furthermore, the significant reduction in pain levels, improved knee range of motion, and increased quadriceps and hip abductor strength observed in the experimental group compared to the control group underscore the clinical relevance of

the intervention. The comprehensive nature of the realignment protocol, addressing both the spinal and lower limb components, appears to have a positive impact on various aspects of knee osteoarthritis management. These findings highlight the potential for a holistic approach in the treatment of knee osteoarthritis, one that not only focuses on symptomatic relief but also aims to address underlying structural factors contributing to the disease. The study's emphasis on utilizing exercise-based interventions, such as the realignment protocol, presents a non-pharmacological and conservative option for managing knee osteoarthritis, aligning with current clinical guidelines that promote exercise therapy as a central component of treatment.

There were several limitations, first the number of subjects were relatively less. Second, radiographic evaluation of knee joint pre and post treatment was not performed in all the subjects. However, pre and post treatment results were calculated including outcome measures such as pain, range of motion and strength which are the main components that gets affected with development of osteoarthritis of knee and improvement in these components helps in controlling the progression of knee osteoarthritis. Thus, this may be sufficient as being the first study that shows better improvement in these outcomes by using re-alignment protocol than the conventional method in postmenopausal females having one or more than one spinal and lower limb malalignment.

Conclusion

The spinal and lower limb realignment protocol, has shown promising results in improving malalignment and reducing symptoms in postmenopausal females with bilateral medial compartment knee osteoarthritis. By addressing structural deviations and promoting improved alignment, this intervention has the potential to positively impact pain, functional outcomes, and overall quality of life in individuals with knee osteoarthritis. Further research and validation are needed to solidify the clinical application of this approach and its long-term effects on disease progression.

Acknowledgement

I wish to acknowledge the support of the administration of Krishna Vishwa Vidyapeeth, Karad, for granting me the opportunity to carry out this research and for providing the essential resources. I am truly thankful for the invaluable guidance and counsel offered by Dr. G. Varadharajulu, Dean of Krishna College of Physiotherapy, KIMSDU, Karad, and Dr. Kakade SV for their assistance in statistical analysis,My sincere gratitude goes to the entire team of faculty members who generously shared their expertise and directed me throughout this research endeavor. Their insights were instrumental in shaping the direction of this research.

Conflict of interest

No conflict of interest is declared by the authors. In addition, no financial support was received.

Funding

Funding for the research was received from Krishna Vishwa Vidyapeeth, Deemed To Be University, Karad.

Ethics Committee-

The study was approved by Institutional Human Ethics Committee of Krishna Institute of Medical Sciences, “Deemed to be University,” Karad (Protocol number-296/2022-2023).

Author Contribution Statement:

KA conducted literature review for this manuscript, developed the introduction section of the manuscript,collected data.SM conducted the discussion of the study and analyzed the data. SS provided a description of the background information, collected data and analyzed the data, and participated in the prescription of the manuscript. All the authors read and approved the final manuscript.

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International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

The Contribution of Some Anthropometric Measurements and Pulmonary Volumes to The Digital achievement of the Sprint 400-meter Competition Among Elite Runners in Palestine

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Abstract
The study aimed to identify the contribution of some anthropometric measurements and pulmonary volumes to the digital achievement of the sprint 400-meter running distance among elite runners in Palestine. A total of 18 elite runners in Palestine, (age: 20.16+1.15 years; body mass: 67.75+5.04 kg; height: 173.11+6.01 m; body mass index (BMI):23.3 +3.1 kg/m2) were categorized as. Anthropometric measurements and Pulmonary volume measurements were taken (VC, FVC, FEV1, FWV1/FVC%, MVV, TV, RV, IC). The authors used Multiple linear Regression. Simple Linear Regression (T) and (Beta) to determine the regression line equation. It was determined that there was no statistically significant relationship between some anthropometric measurements (≤0.05). In order to determine the contribution of measurements chest circumference (r=*0.599), chest circumference (r=*0.573) in inspiration, thigh circumference (r=*0.773) calf (Gastrocnemius) muscle circumference(r=*0.554) it was determined that there was a statistically significant relationship between the digital success of the 400 meter sprint run. It was determined that there was no statistically significant relationship (α≤0.05) between lung volume measurements (FVC, FEV1, FWV1/FVC%, MVV). It was determined that there was no statistically significant relationship (α≤0.05) between lung volume measurements (FVC, FEV1, FWV1/FVC%, MVV). However, VC (p = 0.00); It was determined that there was a significant relationship in terms of (R^2 = 0.616). In conclusin researchers recommend the necessity of using the predictive equations that have been developed as a predictor of digital achievement in the sprint 400-meter running competition.

Keywords
Pulmonary Volume Measurements, Numerical Achievement, Sprint 400-Meter Running Competition

INTRODUCTION

Running is the most popular and at the same time the simplest form of movement that provides versatile benefits to the body, including improving the functioning of the heart, nervous and digestive systems (Pedersen & Saltin, 2015). The fact that it can be done at various distances and that there are various technical solutions to support training control makes it easier for this sport to become widespread among amateurs (Janssen et al., 2017; Janssen et al., 2020). The spread of running as a form of physical recreation in recent years has led to the reflection of this subject in many scientific studies (Eime et al., 2015).

The sprint 400-meter running competition is classified as a short-distance sprint competition according to the International Association of Athletics Federations classifications, as this competition is considered one of the most violent, most thrilling and exciting track competitions. This is reflected by name that was given to it, “the killer

Received: 07 February 2024 ; **Revised** ; 21 February 2024 ; **Accepted:** 02 May 2024; **Published:** 25 May 2024

How to cite this article: Hanon, L., Salameh, H., Qadoume, A., Abualia, M., Khaled, Q., and Khalifa, R. (2024). The Contribution of Some Anthropometric Measurements and Pulmonary Volumes to The Digital achievement of the Sprint 400-meter Competition Among Elite Runners in Palestine. *Int J Disabil Sports Health Sci*;7(3):541-550.https://doi.org/10.33438/ijdshs.1433544

of men or the graveyard of runners" as a result of the pain and fatigue that the runners of this competition experience during the race distance. This pain results from the accumulation of large amounts of lactic acid as a result of the incomplete consumption of glycogen, which is used as energy fuel in the anaerobic system. Therefore, maximum speed, maximum strength, strength characterized by speed, and speed endurance are considered the most important physical elements for success and achievement in this competition (Salama & Khalifa, 2018). Achieving good results in this competition depends heavily on the anthropometric and physiological specifications that the runners possess at the level of the heart muscle, lungs, nervous and muscular systems, in addition to height, leg length, and a fat-free muscular body (Salameh, 2018).

Physiological aspects of running performance were examined and issues related to running economy and energy costs were analyzed. Additionally, biomechanical aspects affecting running economy were also examined (Folland et al., 2017). The issue of morphological diversity of runners focuses on the body proportions, body composition and somatic structure characteristics of competitors at certain distances, as well as the impact of anthropometric characteristics on the results achieved by athletes (Laumets et al., 2017). It has been shown that professional athletes (Olympic champions, finalists and running event participants) clearly differ in age, height and body weight. Sprint champions tend to weigh more than lower-ranked competitors, while distance runners show the opposite trend (Pavlović & Kozina, 2022).

The importance of these specifications was highlighted by one study (Zar et al, 2008; Mande, 2016) by saying that understanding the anthropometric, physical and physiological specifications for each sporting activity is an important and influential factor in sporting achievement, as each sporting activity has its own anthropometric, physical and physiological requirements that pave the way for a player who possesses these requirements to achieve good results. It was also pointed out (Gursavek & Mishra, 2012) that these factors are not less important than the technique used by an athlete in any game, and this requires the attention of coaches and teachers when selecting athletes.

It was pointed out by one study (Parseh & Hassan, 2015) that the medals won by Eastern European players in 1972 and 1976 are due to attention to anthropometric, physical and physiological requirements when selecting talented athletes, according to the requirements of each game, and this has been confirmed by many studies that dealt with studying the relationship of anthropometric and physiological measurements with sporting achievement. One of these studies (Salama & Khalifa, 2018) showed that abdominal circumference and instep length were the most contributing anthropometric measurements to the level of digital achievement for the 400m running event, as they contributed to explaining (13.8%) of the achieved time. Another study (Rathore, 2016 & Mishra) found a statistically significant relationship between height, body mass, leg length, and thigh circumference with the 50-yard speed test, and another study (Singh & Malik, 2015) showed a statistically significant relationship exists between height, leg length, shoulder circumference, hip circumference, shoulder diameter, elbow diameter, thigh skin thickness, biceps brachii skin thickness and the 100-meter sprint achievement. Moreover, one study (Singh & Malik, 2015) showed a statistically significant relationship between height, leg length, shoulder circumference, hip circumference , shoulder diameter, elbow diameter, thigh skin thickness, biceps brachii skin thickness and sprint 400-meter running achievement. A different study (Omelchenko et al, 2023) showed a positive and direct relationship between height and body mass with measurements of related pulmonary volumes (VT, FEV1, FVC, MV, ERV, IRV, VC, MVV). Another study (Salameh et al, 2020) showed that the Pulmonary volume measurements that were most capable of predicting physical efficiency are (FEV1, FVC), which contributed to explaining 73.5%, 78.3% of the physical efficiency index respectively. Another study (Mazic et al, 2014) showed that there was a statistically significant relationship between the (VC) measurement and players who played boxing and rugby. It also showed that there was a relationship between the (FVC) measurement and players who played cycling, football, and boating, as well as a relationship between the FEV1 measurement and boxing and water polo players. Another study (Yasuaki et al, 2006) showed that high school football players in Yanazaki Prefecture in Japan are characterized by high levels of pulmonary volume measurements related to (TLC, VC). A different study (Cheng et al, 2003) found that people who

practice sports activities have high levels of Pulmonary volume measurements (FVC, FEV1, FEV1/FVC%).

Given the importance of anthropometric measurements and pulmonary volumes among runners in the sprint 400-meter competition, this study came as a practical scientific attempt by the researchers to determine the most contributing of these measurements to the digital achievement of the of the sprint 400-meter running in light of the unsatisfactory results achieved by the runners of this competition at the national level, which is the basis for the problem statement of the study.

MATERIALS AND METHODS

The researchers conducted the study on a purposive sample of (18) elite sprint 400-meter runners in Palestine, also the researchers obtained ethical permission from participants to do study, and Table No. (1) shows the characteristics of the study sample. The study was approved and supervised by the departmental research committee, Palestine Technical University - kadoorie (Ref: 2024/2 Date: 20. Feb. 24). Also the current study involving human participants was approved and obtained ethical permission from them.Participant provided informed consent, with the volunteer form covering research details, risks, benefits, confidentiality, and participant rights. The research strictly adhered to the ethical principles of the Declaration of Helsinki, prioritizing participant's rights and well-being in design, procedures, and confidentiality measures.

Table 1. Characteristics of the study sample according to the variables of age, height, and body mass (N = 18)

Variables	Measuring unit	Minimum	Maximum	M	SD	Skewness coefficient
Age	Year	18.00	22.00	20.16	1.15	-0.101
Body mass	Kg	60.00	78.00	67.75	5.04	.3890
Height	Cm	160.00	183.00	173.110	6.010	-0.379

Mean:M; Standard Deviation: SD

It is clear from the results of Table (1) that the values of the Skewness coefficient are between (± 3) and this indicates that the study sample is subject to the normal distribution.

Study procedures

Anthropometric measurements were performed related to (age, body mass, height, arm length, leg length, thigh length, lower leg length, instep length, chest circumference, chest circumference with inspiration, abdominal circumference, thigh circumference, calf (Gastrocnemius)circumference, and upper arm (humerus) circumference using a ristameter and tape measure.

Measurements of Pulmonary volumes (VC, FVC, FEV1, FWV1/FVC%, MVV, TV, RV, TLC) were performed using a spirometer.

The digital achievement measurement for the sprint 400-meter running event was conducted on the track of the College of Physical Education and Sports Sciences at Palestine Technical University "Kadoorie."The study was conducted in the time period 1-8/ 10-8-2023.

The following is an explanation of the study procedures:

Anthropometric measurements

***First*: Height and body mass (body weight)**

To measure height, the researcher used a "rectameter" device, which is a stand installed vertically on a wooden edge, 250 cm long, so that the zero is at the level of the wooden base. There is also a stand installed horizontally on the stand so that it can be moved down and up. The test subject stands on the wooden base with his back facing the stand so that it touches it at three points: the area between the two shoulder boards, the farthest point of the pelvis from the back, and the furthest point of the calves of the legs. Care must be taken to pull the body up and look forward, and the stand is lowered until it touches the upper edge of the skull so that the number facing the stand expresses the length.

Second: The lengths of the limbs include

Arm length: A tape measure in centimeters is used to measure the arm from the lateral edge of the acromial process to the end of the middle finger when it is straight**.**

Leg length: The length of the lower limb is measured using a measuring tape from the greater trochanter of the upper head of the thigh joint to the floor.

Thigh length: Thigh length is measured using a tape measure from the greater trochanter of the superior head of the femur to the lateral edge of the middle of the knee.

Lower Leg length: Leg length is measured using a measuring tape from the medial edge of the middle of the knee joint to the medial prominence of the heel.

Instep length: The instep length is measured using a tape measure from the end of the heel bone to the tip of the big toe.

Third: The circumferences and they include

Chest circumference in the normal position: The chest circumference is taken at a level exactly above the nipple and the average circumference of the maximum inhalation and the minimum circumference during maximum exhalation are calculated.

Chest circumference during inhalation: The chest circumference is taken as in the previous method, but after the tester takes the maximum breath (inhalation) and holds it until the chest circumference is read.

Upper arm circumference during diastole: The largest circumference during contraction and relaxation .***Abdominal circumference***: The smallest circumference of the abdomen above the navel is 2-3 cm.

Thigh circumference: The largest circumference of the thigh directly below the buttocks.

Calf circumference: The largest circumference is at the calf (Salama, 2018)

Pulmonary Function Measurement

The researchers used an electronic spirometer, type of AstraTouch, American made and manufactured by SDI Diagnostics company. It is considered one of the modern and accurate devices that measures more than 40 dimensions.

Measurement instructions

Measurements were carried out at (10:00-12:00) in the morning, at a temperature of (27) degrees Celsius.

Students who smoke and students who have respiratory diseases were excluded.

Students were told to eat breakfast at least two hours before the test time.

The students were asked not to engage in any sporting activity before the measurement.

Measurements mechanism

Measurements were performed according to the American Thoracic Society and European Respiratory Society (ATS/ERS) guidelines according to the following steps:

The measurement mechanism was explained to all players before starting the measurement, along with the performance of a model for each test.

Measurements were taken from a sitting position on a chair.

The noses were closed with plastic forceps designated for this purpose.

Players take tests with three attempts for each test, with the best one being recorded.

(FVC,FEV1FEVI/FVC%,) was measured by the player taking the maximum inhalation and then following it with the maximum exhalation.

(VC) was measured by the player breathing three times normally in the spirometer, and the fourth time the player took the maximum inhalation followed by the maximum exhalation, so we obtained measurements (ERV, IRV, SVC, TV).

(MVV) was measured by performing a breathing maneuver with the maximum possible inhalation and exhalation for 12 seconds (ATS, 2001).

The digital achievement measurement was taken for the sprint 400-meter running competition on the Olympic track of the Physical Education and Sports Sciences Faculty at Palestine Technical University “Khadoorie”.

Statistical analysis

The authors used IBM SPSS version 26 to analyze data by using means, standard deviations, skewness and Stepwise Multiple linear Regression. Simple Linear Regression (T) and (Beta) to determine the regression line equation

RESULTS

Results related to the first study question, which states

What are the most anthropometric measurements contribute in the digital achievement of the sprint 400-meter running competition among elite runners in Palestine?

To answer this question, firstly, the researchers found the values of the Pearson correlation coefficient between anthropometric measurements and the digital achievement of the sprint 400-meter running competition among elite runners in Palestine, and Table (2) shows that.

Table 2. Pearson correlation coefficient between some anthropometric measurements and the digital achievement of the sprint 400-meter running (N= 18)

Anthropometric measurements	M	SD	R-value*
Age (year)	20.16	1.15	0.299
Body Mass (kg)	67.75	5.04	0.441
Height (cm)	173.11	6.01	0.213
Arm Length(cm)	73.50	5.03	0.153
Leg Length (cm)	90.78	3.66	0.105
Thigh Length (cm)	47.39	3.91	0.289
Lower Leg Length (cm)	43.44	2.38	-0.364
Instep Length (cm)	26.56	1.76	-0.339
Chest Circumference (cm)	86.44	5.49	*0.599
Chest Circumference With Inspiration (cm)	89.50	5.23	*0.573
Abdominal Circumference Abdominal Circumference (cm)	76.17	4.08	-0.098
Thigh Circumference (cm)	50.78	3.39	*0.773
Calf (Gastrocnemius) Muscle Circumference (cm)	35.39	2.87	*0.554
Upper Arm Circumference (cm)	28.94	2.15	0.297

From the results of Table (2), it is clear that there is no a statistically significant relationship at the level of significance ($\alpha \leq 0.05$) between some measurements of anthropometric related to measurements: (age, body mass, height, arm length, leg length, thigh length, lower leg length, instep length, abdominal circumference, upper arm circumference), and the digital achievement of the sprint 400-meter running, while there is statistically significant relationship with chest circumference, chest circumference with inspiration, thigh circumference, calf (Gastrocnemius) muscle circumference) and the digital achievement of the sprint 400-meter running. In order to determine the contribution of (chest circumference, chest circumference with inspiration, thigh circumference, calf (Gastrocnemius) muscle circumference) measurements, linear stepwise regression analysis was applied to identify the possibility of developing a predictive equation from some Pulmonary volumes measurements chest circumference, chest circumference with inspiration, thigh circumference, calf (Gastrocnemius) muscle circumference) as an independent variables with the digital achievement of the sprint 400-meter running as a dependent variable, and Table (3) shows this.

Table 3. Results of ANOVA analysis to identify the regression coefficient of the predictive equation for the digital achievement of the sprint 400-meter running (n=18).

Model	**Source of variance**	**Sum of Squares**	**df**	**Mean Square**	**F**	**P-Value**	**R^2**
Thigh circumference	Regression	181.881	1	81.881	23.817	*0.000	0.598
	Residual	55.006	16	3.438			
	Total	136.887	17				

* Significance level ($\alpha \leq 0.05$).

Table (3) indicates that the some anthropometric measurements that contribute the most to the numeric achievement of the sprint 400-meter competition among the elite runners in Palestine was Thigh circumference, where the (R^2) value was calculated at (0.598), and to identify the equation of the regression line, the (t) test and the beta coefficient were used and the results of the table (4) Explain that.

Table 4. Results of the t-test and the beta coefficient of the regression line equation for the contribution of some anthropometric measurements to the digital achievement of the sprint 400-meter running competition among elite runners in Palestine.

Model	Value	Standard Error	Beta	T	P-Value	R^2
Constant	21.859	6.754		3.236	*0.005	
Thigh circumference	0.648	0.133	-0.773	4.880	*0.000	0.598

*Significance level ($\alpha \leq 0.05$)

It is clear from the results of Table No. (4) that the value of (T) was statistically significant at the level of significance ($\alpha \leq 0.05$), as the Thigh circumference measurement contributed to explaining (59.8)% of the digital achievement of the sprint 400-meter run, and therefore the proposed equation becomes as follows: **Digital achievement for the 400 meter sprint competition** = 21.859 + ((Thigh circumference (cm) × 0.648)).

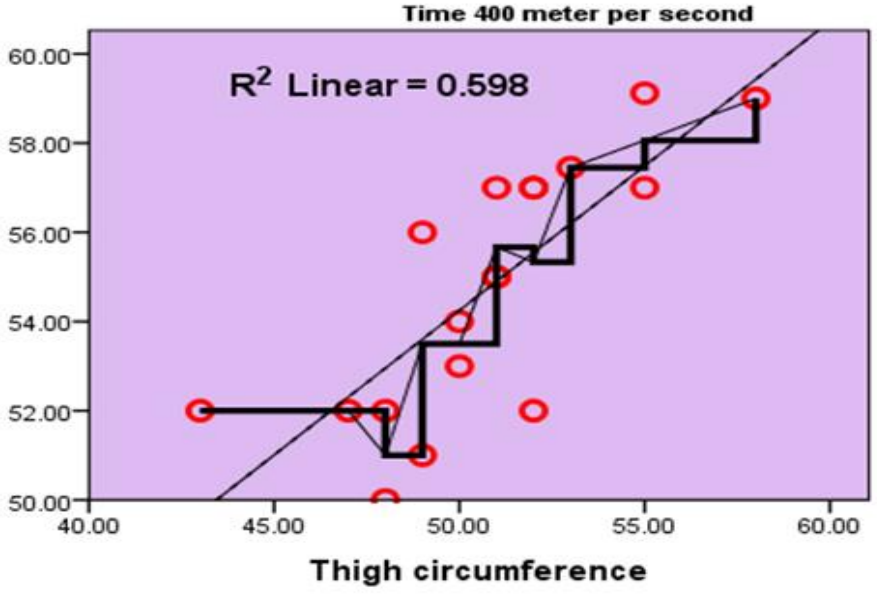

Figure 1. Thigh circumference measurement as a predictive in the digital achievement of sprint 400 meter.

Results related to the second study question, which states

What are the most pulmonary volume measurements contribute in the digital achievement of the sprint 400-meter running competition among elite runners in Palestine?

To answer this question, firstly, the researchers found the values of the Pearson correlation coefficient between pulmonary volume measurements and the digital achievement of the sprint 400-meter running competition among elite runners in Palestine, and Table (5) shows that.

Table 5. Pearson correlation coefficient between pulmonary volume measurements and the digital achievement of the sprint 400-meter running (N= 18)

Pulmonary volumes measurements	Measuring unit	M	SD	R-value*
VC	L / min	4.80	0.61	*0.785
FVC	L / sec	4.26	0.49	0.298
FEV1	L / min	4.13	0.45	0.249
FEV1/FVC%	%	95.68	4.78	-0.01
MVV	L / min	166.79	24.53	0.18
TV	L / min	1.39	0.57	0.184
IRV	L / min	1.57	0.56	0.455
ERV	L / min	1.43	0.65	-0.269
IC	L / min	3.39	0.65	*0.48
RV	L / min	1.09	0.13	0.458

Standard deviation:SD; Mean:M; * Significance level ($\alpha \leq 0.05$).

From the results of Table (5), it is clear that there is no a statistically significant relationship at the level of significance (α≤0.05) between measurements of Pulmonary volumes related to measurements: (FVC, FEV1, FWV1/FVC%, MVV, TV, RV,) and the digital achievement of the sprint 400-meter running, while there is statistically significant relationship with (VC, IC) and the digital achievement of the sprint 400-meter running. In order to determine the contribution of (VC, IC) measurements, linear stepwise regression analysis was applied to identify the possibility of developing a predictive equation from some Pulmonary volumes measurements (VC, IC) as an independent variables with the digital achievement of the sprint 400-meter running as a dependent variable, and Table (6) shows this.

Table 6. Results of ANOVA analysis to identify the regression coefficient of the predictive equation for the digital achievement of the sprint 400-meter running (n=18).

Model	Source of variance	Sum of Squares	df	Mean Square	F	P-Value	R^2
VC	Regression	84.306	1	84.306	25.654	*0.000	0.616
	Residual	52.581	16	3.286			
	Total	136.887	17				

* Significance level (α ≤ 0.05).

Table (6) indicates that the pulmonary volume measurement that contributed the most to the digital achievement of the sprint 400-meter running competition among elite runners in Palestine was VC, as its (R^2) value was calculated at (0.616). To identify the equation of the regression line, the t-test and the beta coefficient were used and Table (5) shows the results.

Table 7. Results of the t-test and the beta coefficient of the regression line equation for the contribution of some Pulmonary volume measurements to the digital achievement of the sprint 400-meter running competition among elite runners in Palestine.

Model	Value	Standard Error	Beta	T	P Value	R^2
Constant	37.274	3.477		10.719	*0.000	
VC	3.643	.719	0.785	5.065	*0.000	0.616

* Significance level (α ≤ 0.05).

It is clear from the results of Table No. (7) that the value of (T) was statistically significant at the significance level (α≤0.05), as the VC measurement contributed to explaining (61.6)% of the digital achievement of the sprint 400-meter race, and therefore the proposed equation becomes as follows:

Digital achievement for 400 meters = 37.274 + ((VC (unit of measurement) x 3.643)).

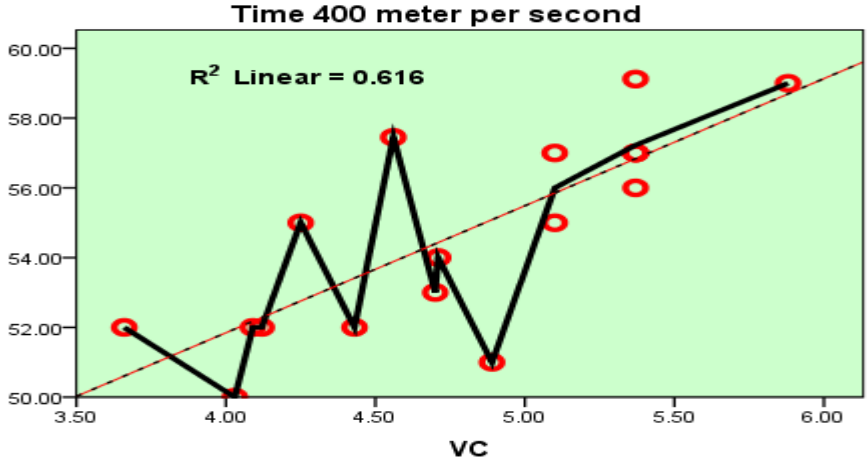

Figure 2. VC measurement as a predictive in the digital achievement of sprint 400 meter.

DISCUSSION

The intensity and frequency of sports performed by athletes determine the level of strengthening of the inspiratory muscles by increasing the volume and capacity of the lungs. Exercise increases the endurance and strength of athletes' breathing muscles, reduces resistance in the respiratory tract, and increases lung elasticity and alveolar expansion by promoting expansion of lung volume and capacity (Khosravi et al. 2013). Vital capacity is a reflex of the ability of lung tissue elasticity, or stiffness of the movement of the thoracic wall. The main factors that affect vital capacity are the anatomical shape of the body, position during measurement of vital capacity, respiratory muscle strength and lung and chest skeletal development (Guyton and Hall, 2014).

Discussing the results related to the first question:

The results in tables (2 and 3) indicate that the most contributing anthropometric measurements to the digital achievement in the sprint 400-meter running competition among elite runners in Palestine is the "Thigh circumference", as it contributed to explaining (59.8)% of the digital achievement in the sprint 400-meter running competition among elite runners in Palestine. The results of this study are consistent with the results of other studies (Salama & Khalifa, 2018; Ali & Nasser, 2016; Mishra & Rathore, 2016; Singh & Malik, 2015; Aldhiabat, 2014; Goswami, 2013; Mishra & Gursavek, 2012; Majhol, 2006). The researchers attribute this consistency to the nature of the physical and anthropometric requirements for this competition, in addition to the fact that it relies heavily on a combination of phosphogonic and lactic system training (strength, speed, strength characterized by speed, and speed endurance), the intensity of which may reach 100% of the runner's maximum ability, and this would target white (fast-twitch) muscle fibers, thus increasing the size of the muscle and its cross-section, and this was confirmed by Al-Jumaili and Al-Alwani (2024) when they said that (80%) of the muscle fibers of short-distance runners are of the type of white muscle fibers (Fast Twitch Fibers). The sprint 400-meter runners are also characterized by having fast oxidative glycolytic muscle fibers. What is new is that the percentage of white muscle fibers in skeletal muscles is (40-50%), and is greatly affected by training for maximum strength, maximum speed, strength characterized by speed, and speed endurance. This leads to important training adaptations, such as increasing the strength and speed of muscle contraction and increasing the size of the muscle and the thickness of its fibers. These adaptations are among the most important anthropometric requirements for short-distance runners, specifically sprint 400-meter runners.

Results related to the second study question,:

The results shown in Tables (4,5) indicate that the Pulmonary volume measurement that most contributed to the digital achievement in the sprint 400-meter running competition among elite runners in Palestine was Vital Capacity (VC), which contributed to explaining (61.6%) of the digital achievement in the sprint 400-meter running competition among elite runners in Palestine. The results of this study are consistent with the results of other studies (Salameh et al, 2020; Hulke & Phatak, 2011; Can, 2010; Balcom et al, 2006; Yasuaki et al, 2006; Falaschetti et al, 2004; Cheng et al, 2003). The researcher attributes these results to the nature of the physical requirements of the sprint 400-meter running competition, which are linked to the element of speed, and speed is closely related, and therefore, training for this event requires the contribution of the anaerobic system (phosphatase and lactate) to producing energy, and this improves the strength and efficiency of the breathing muscles (the diaphragm muscle, the intercostalis, the external intercostal muscle, the clavicular mastoid, and the spinalis muscle), which increases the flexibility and expansion of the rib cage during the breathing process. This allows for better performance of respiratory operations in runners during physical exertion. The density of the surrounding blood capillaries in the alveoli of the lungs also increases as a result of the opening of a number of closed or inactive capillaries, or new capillaries are generated under the influence of continuous repetitions of physical effort. This leads to an increase in the surface area on which gases are exchanged between the capillaries and pulmonary alveoli, not to mention an increase in the elasticity of the lungs and their ability to expand and contract to perform strong and deep breathing movements, and thus the efficiency of Pulmonary volumes improves, both static and kinetic, the most important of which is measuring vital capacity (VC), which is one of the most important functional indicators of Pulmonary efficiency, thus increasing the volume of inspiratory reserve over expiratory

reserve in runners as a result of speed endurance training.

Conclusion

It is clear from the results of the study that anthropometric measurements, as well as pulmonary volume, can be used to predict measurements of achievement in the sprint 400-meter running competition.

Conflict Of Interest

No potential conflict of interest relevant to this article was reported.

Acknowledgments

We extend our sincere thanks to the administration of Palestine Technical University - Khadoorie (PTUK) for providing financial and moral support for the success of our research.

Ethics Statement

The study was approved and supervised by the departmental research committee, Palestine Technical University - kadoorie (Ref: 2024/2 Date: 20. Feb. 24). Also the current study involving human participants was approved and obtained ethical permission from them.

Author Contributions

Study Design: LH, AQ; Data Collection: LH,HS, MA,KQ and RK; Statistical Analysis: LH and AQ; Data Interpretation: LH,HS,KQ and RK; Manuscript Preparation, LH, AQ and RK; Literature Search: LH,MA and HS. All authors have read and agreed to the published version of the manuscript.

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International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

Psychological hesitation in performing touch among Paralympic players in the Salma Hussein Al-Jumaili Championship

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Abstract
The goal of the study is to measure the degree of psychological hesitancy experienced by the Olympic fencers competing in the Salma Hussein Al-Jumaili Championship during touch performances. The study made the assumption that psychological reluctance differs between male and female players. To fit the nature of the research, the researchers adopted the descriptive technique in the comparison procedure. The research community was identified as players participating in the Salma Hussein Al-Jamili championship, they represent the population and the research sample only. Forms that do not meet the conditions were excluded from them, so their number reached (70) students. They were chosen intentionally and the tools used in the research were the psychological hesitation scale. The researcher used the appropriate statistical treatment and the researchers concluded that there is psychological hesitation among the Paralympic fencing players in a manner close to the hypothesized mean. There is more psychological hesitation for female players than for male players, and this is what the results showed. Therefore, the researchers recommend that coaches pay attention to the psychological preparation of Paralympic fencing players in general and fencing in particular in order to gain control and self-confidence in order to get rid of psychological hesitation. Pay attention to increasing the confidence of Paralympic fencing players and their ability to make decisions. To prevent psychological problems and hinder their performance.

Keywords
Psychological hesitation, Paralympic, Championship Salma Hussein

INTRODUCTION

Fencing for the disabled has entered the field of competitive sports for the disabled since the last century in the Arab world. It is a popular sport loved by the disabled and is considered a fine movement sport that develops the capabilities of the disabled person and the elements of his special physical fitness, in addition to the psychological addition of specific focus, confidence and self-reliance because the disabled person depends on his hand and limb (Al-Haddad, 2023). The upper arm holding the sword, the trunk muscles, the shoulders, and the second arm for balance, any healthy player will find it extremely difficult to fencing on a wheelchair if he sits on it, as the lower extremities are extremely important in this sport for his attack and defense, and reaching high athletic levels requires obtaining complete and accurate information about the performance and activity of the players in all situations of play, which This is done through the results of the players during the competition, by which we mean tracking the performance during the match (Hamoudi, & Malih, 2012).

Reaching the pinnacle of achievement in a tournament in any type of sporting activity is linked to a continuous and integrated series of procedures and steps based on scientific foundations and objective means (Aziz, & Al-Haddad , 2022). The most important thing is the psychological characteristics of the player, as they affect his results. Psychological hesitation hinders the player

Received: 14 January 2023 ; **Revised** ; 04 March 2024 ; **Accepted:** 03 May 2024; **Published:** 25 May 2024

How to cite this article: Alhaddad, N.H., and Hussein, A.R.A. (2024). Psychological hesitation in performing touch among Paralympic players in the Salma Hussein Al-Jumaili Championship. *Int J Disabil Sports Health Sci*;7(3):551-555.https://doi.org/10.33438/ijdshs.1419452

from concentrating and gathering his strength during performance because he is busy thinking about performing (Al-Haddad, 2022). Or not performing it, an internal conflict is generated within the fencer. This conflict is caused by the player's reluctance to perform, because he has lost confidence from himself, and the fencer who does not have self-confidence is unable to perform the stab to take the touch. Therefore, the importance of the research lies in identifying the difference in the psychological hesitation of touch performance between male and female players in the Salma Hussein competition held in the training center in the Paralympic Committee hall in the Ministry of Youth and Sports on 16-19/12/2022.

The problem with the research is that psychological hesitancy is one of the fundamental psychological states that is fundamental and effective in controlling high sporting achievement because good psychological preparation helps in overcoming many of the emotions, conflicts, and psychological crises that an individual athlete encounters in daily life, especially in the sporting aspect like the competition environment. attaining lofty goals and learning difficult abilities that involve danger led the researchers to decide to shed light on the psychological reluctance, especially among the Olympic fencing competitors (Star& Malih, 2012). The study's objective is to measure the psychological hesitancy experienced by both male and female Paralympic competitors in the Salma Hussein Championship. According to the idea, there are no differences between male and female players' psychological reluctance to make contact (Abdul Razzaq, & Al-Haddad, 2024).

MATERIALS AND METHODS

Research Methodology

To address the issue with the current research, the researchers employed the descriptive approach and the comparative method. This study was performed by adhering to the Helsinki Declaration. Ethical approval of the study was obtained from University of Baghdad, Iraq Ethics Committee. Participant provided informed consent, with the volunteer form covering research details, risks, benefits, confidentiality, and participant rights. The research strictly adhered to the ethical principles of the Declaration of Helsinki, prioritizing participant's rights and well-being in design, procedures, and confidentiality measures.

Research community and sample

The participants in the Salma Hussein Al-Jumaili tournament, who represented the 13 governorates of Babil, Diwaniyah, Salah al-Din, Dhi Qar, Wasit, Diyala, and the clubs Al-Wisam, Al-Dhari, Al-Ishraq, Al-Shumukh, and Ashnouna, were identified as the research community by the researchers. There were 60 male and female players in the tournament.

Field research techniques

Procedures for the psychological hesitation scale:

The psychological reluctance scale was developed based on a measure created for gymnastics students at the College of Physical Education (Yasser Ahmed, 2013). For Paralympic athletes, a psychological reluctance scale was created. The scale, which measured psychological hesitancy, included forty items. There were (14) unfavorable things and (26) good ones. To modify the scale to evaluate psychological reluctance, the scale was given to experts and professionals.

Exploratory experience:

Three players from the Al-Thari Club in Baghdad participated in the experiment one month prior to the competition, and it was used to test the sample's comprehension of the scale's phrases and determine whether the response contained any significant ambiguity in order to catch any issues before the scale's main application process.

Scale correction:

There are (40) items total on the psychological reluctance scale, with (26) positive and (14) negative items. The positive items were examined in the paragraphs (5-4-3-2-1) while the negative items were reviewed in the paragraphs (1-2-3-4-5). The greatest score for a response on the scale was (189) and the lowest score was (49) based on the five-point answer possibilities.

Scientific characteristics of the scale

Validity of the scale

This means that "the test measures what it was designed to measure and does not measure anything else (Mustafa Bahi, 1999). Apparent Validity. This type of Validity was achieved when the psychological hesitation scale was presented to a group of experts and specialists in the field of sports psychology, as well as its discriminatory ability, which was not included in the research to increase the number of research papers.

Reliability of the scale

One of the requirements for the scale to be accurate is that it be reliable. According to (Huda

Jalal Muhammad, 2008) reliability is the capacity of a test to provide the same findings when administered a second time to the same subjects under same conditions. The Cronbach alpha equation was used to derive dependability using the Cronbach alpha approach. The psychological hesitation scale has a reliability value of (0.81), which is a strong indication of the scale's stability.

Main experiment

A psychological hesitation questionnaire was distributed to male and female fencing players participating in the Salma Hussein Championship before the start of the competition. It took 10-17 minutes to answer the psychological hesitation questionnaire. After completing the psychological hesitation test, they prepared to warm up and prepare for the competition.

Statistical methods

A statistical program was used in the statistical analysis of the data obtained. Arithmetic mean, standard deviation, frequency, minimum and maximum values were used in statistical representations of the data. Independent Samples T-test were used in the analysis of normally distributed data.

RESULTS

Results presentation, analysis, and debate

Presentation of the results and analysis of the level of psychological hesitatio

Table (1) shows the level of psychological hesitation among Olympic fencing players

One-Sample Test						
	Test Value = 120					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference Lower	Upper
Psychological hesitation	14.529	59	.000	2.36667	2.0407	2.6926

At degrees of freedom (59) and significance level (05.0)

According to Table 1, it appears that the psychological hesitation scale was applied to (60) male and female Olympic fencers, as the data revealed that the calculated (t) value of (14.52) with an error level of (0.00)is less than the significance level of (0.05) which means that there are statistically significant differences between the hypothesized mean of the scale and the sample mean are in favor of the sample mean.

Presenting the results and analyzing the differences between male and female Olympic fencing players on the psychological hesitation scale

Table (2) shows the means, standard deviations, calculated (t) value, and error level

Group Statistics					
	Gender	N	X	SD	Std. Error Mean
Psychological hesitation	1.00	15	122.4000	0.98561	0.25448
	2.00	45	121.6889	1.18364	0.17645

Std. Deviation (SD), Mean (x)

DISCUSSION

It was shown from Table (2) that the arithmetic mean of the psychological hesitation of male and female players was (121.6889), with a standard deviation of (1.18364). The arithmetic mean of the psychological hesitation of male and female players was (122.4000) , and the standard deviation was (0.985). The value of the T between the psychological hesitation of male and female players was (-4.1632).

It appears from Table (2) that there are differences between male and female players in psychological hesitation due to the effect of psychological hesitation on performance, because psychological hesitation makes the player not confident in himself regarding his performance, and creates a kind of fear and confusion for him when taking the touch, so he cannot score a touch if he is hesitant, so the successful coach must To develop the student's abilities by how to deal with his psychological problems and get rid of the hesitation that occurs in

the student during performance, since psychological hesitation is "a psychological state that characterizes the individual when he tries to make his decisions, especially if this decision is fateful, so he hesitates in making the decision for various reasons such as fear, lack of confidence, or boredom" (Qaba, 1999). It makes a player his inability to take a touch, which depends on increasing the player's self-confidence in order to gather all his physical and psychological strength for the success of his performance, which ends with taking a touch. Psychological hesitation hinders the player's thinking to gather his psychological energy, because of the fear and hesitation that occurs in him, and he is born a kind of psychological conflict that distracts his thoughts and makes him unable to perform the shot required of him, since "fear and psychological conflict are forms of psychological emotions that affect the athlete's achievement" (Kamel, 1981). According to what was mentioned, the lower the psychological hesitation of the players, the greater the success. They perform better. Here, the coach must work on the psychological preparation of the players to remove their psychological hesitation while confronting the opponent, whoever he may be (Jawadand Jassim, 2008).

Conclusions

There is a psychological hesitation among Paralympic fencing players that is close to the hypothetical mean. There is a psychological hesitation for female players a little more than for male players, and this is what the results showed.

Recommendations

The coaches' interest in the psychological preparation of Olympic players in general and fencing in particular in order to gain control and self-confidence in order to get rid of psychological hesitation. Using the psychological hesitation meter on other games. Paying attention to increasing the confidence of Paralympic fencing players and their ability to make decisions to prevent psychological problems and their hindering their performance.

Conflict Of Interest

No potential conflict of interest relevant to this article was reported.

Ethics Statement

This study was performed by adhering to the Helsinki Declaration. Ethical approval of the study was obtained from University of Baghdad, Iraq Ethics Committee.

Author Contributions

Study Design: NHA and ARAH; Data Collection: NHA and ARAH; Statistical Analysis: NHA and ARAH; Data Interpretation: NHA and ARAH; Manuscript Preparation, NHA and ARAH; Literature Search: NHA and ARAH. All authors have read and agreed to the published version of the manuscript.

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International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

Investigation of Recreation Area Participation Barriers of Families With Special Needs

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Abstract
Families, as fundamental units of society, represent the primary social context in which individuals spend the majority of their lives. The objectives of parenthood generally include the aim to nurture healthy and contented children. However, the birth of a child with health issues often necessitates a reevaluation of these objectives. Such circumstances directly impact the standards of living and daily routines of many parents. Numerous scientific studies have explored the ramifications of these effects. This study aims to investigate the barriers that impede the participation of families with children with special needs in recreational activities. A total of 555 parents from Mersin Province were recruited using a purposive sampling method. The study utilized the Scale of Participation Barriers to the Use of Recreation Area, developed by Gümüş and Alay, along with an Information Request Form as the primary data collection tools. In addition to descriptive statistics, the study employed the t-test for comparing the averages of two independent groups with a normal distribution, and one-way variance analysis for analyzing three or more groups. The results of the analysis revealed that the most significant barriers to participation in recreational areas were related to the 'sports area barrier' (4.01), 'individual barrier' (3.34), and 'time barrier' (2.89).

Keywords
Recreation, Participation Barriers, Children With Special Needs, Parents, Leisure

INTRODUCTION

Various policies have been put into effect in our country so that those with health problems can contribute to society. As a result of these policies, National Disabled Data System was developed using disability reports of medical boards issued by state institutions and organizations under the Directorate General of Services for Persons with Disabilities and the Elderly of Ministry of Family and Social Policies and the system helps shed lights on the data about the disabled population. According to the statistical bulletin for the disable and the elderly issued in April, 2023; there are 2.511.950 alive and disabled people -1.414.643 male disabled individuals, 1.097.307 female disabled individuals- registered to the National Disabled Data System, Ministry of Social Affairs, and Directorate (April, 2023).

Children's participation in parks and recreation includes participation in daily activities such as entertainment, leisure, school and home activities. The activities that individuals freely choose to participate in during their leisure time, whether active or passive, contribute to the development of motor, language and social skills while influencing human activity components such as relaxation, enjoyment and fulfillment. While shaping children's interests, skills and preferences, it also contributes to the development of their physical health, social emotional well-being, friendship relationships and sense of community (Alper & Başaran, 2023; Kurt et al., 2022). As it is very difficult for individuals with special needs to

Received: 15 January 2024 ; **Revised** ; 18 February 2024 ; **Accepted:** 03 May 2024; **Published:** 25 May 2024

How to cite this article: Koyuncu, M., Gümüş, H., and Bolat, E.Y. (2024). Investigation of Recreation Area Partıcıpatıon Barriers of Families With Special Needs . *Int J Disabil Sports Health Sci*;7(3):556-563.https://doi.org/10.33438/ijdshs.1420511

live their lives alone as an individual, it also brings a lot of duties, responsibilities and burdens to families in bringing these children into society. Families with children with special needs face various obstacles (transportation, health, time, economic, nutrition, education, physical activity, etc.) in the community and family environment. By targeting families with children with special needs in the concept of family, which constitutes the smallest building block of society, this study focuses on determining the types of obstacles faced by these families in their participation in recreation areas. For instance, in the studies carried out, wheelchair users' access to these facilities is limited due to obstacles such as bad weather conditions, unfavorable climate, not cutting the sidewalks or not making the sidewalks properly. After accessing these facilities, the fact that they have limited strength and fitness, the physical environment of the facilities such as toilets, doors, parking areas, flooring, ramps, personal illnesses, public transportation and transportation problems show that there are many barriers to physical activity. Barriers include lack of transportation, inability to pay for fitness membership, lack of information on where and how to exercise, and lack of understanding of the importance of exercise in improving their current condition and health (Rimmer, Riley, Wang, Rauworth, & Jurkowski, 2004). Studies have focused on families having children with special needs and their constraints and barriers in participating in recreation areas in relation to family making the smallest unit of the society.

In many European countries, local authorities organize and plan leisure time activities of children with special needs (Lundbäck & Fälth, 2019; Lale et al., 2023) whereas in our country, such organization and planning do not exist in the real sense. The objective of this study is to explore the barriers and constraints to joining recreation areas that children with special needs face and to present a case study rather than to investigate how leisure time activities should be for these children of working parents.

As mentioned by the scientists, the most crucial step to eliminate a problem is to diagnose it. Therefore, if leisure time barriers of the families having children with special needs are uncovered, recommendations can be made for policy makers and local authorities to eliminate these constraints and barriers to participation. In studies that investigated the achievement of learning outcomes in relation to leisure time activities among children with special needs, it is suggested that leisure time activities play a positive role in the achievement of learning outcomes (Göransson & Nilholm, 2014; Seyrek et al., 2023; Almqvist, Malmqvist, & Nilholm, 2015). Almqvist et al. (2015) conducted a study that drew attention to collaborative learning as a successful method and demonstrated that recreation areas made a positive contribution to this learning process and emphasized that different studies should be done to explore the importance of recreation areas for children with special needs. For families with special needs who spend most of their lives in small and limited social groups (Cavkaytar, 2018), recreation areas and accessibility to these areas are important so that they can develop themselves in many ways. In the study of Gümüş et al. (2017), factors that affected choosing recreation areas and participation in activities among 412 individuals aged over 16 years who used park and recreation areas in Ankara Province for physical activity purposes were examined. As a result of the study, it was identified that reasons not to join physical activities in park and recreation areas (gender, educational level and smoking status) differed significantly and found that gender, age, educational level, body mass index and smoking status did not create a difference in choosing recreation areas (Gümüş et al., 2017).The study of Sarol (2017) reviewed the factors that prevented/restricted and facilitated physical activity participation among 691 participants who lived in different counties of Ankara Province and as a result of the study, identified that an important factor upon female participation in physical activities was “structural facilitators” and concluded that being single played a bigger role in preventing the participation in physical activities. As income level increased, perceived barriers reduced in these 691 participants. The most important barrier to physical activity participation was found to be “structural barriers” while the most important factor that facilitated participation was “individual facilitators” (Sarol, 2017). As for the study of Akyol and Ilkım (2018), they investigated participation in sportive activities among 35 children with special needs aged between 10 and 15 years in Malatya Province (11 children diagnosed with autism, 6 children with physical disabilities, 10 children with Down syndrome and 8 children with mild mental disabilities) and concluded that

children were willing to join sportive activities but educators had insufficient knowledge and skills and participants had communicational problems with local authorities. They suggested that families of the disabled children faced different difficulties when they transferred the children to physical activity areas, (environmental factors, heavy traffic, social discriminations, economical structure of the family, etc.), despite these constraints they continued to drive their children to these activities and suffered from both environmental, systemic barriers and bureaucratic barriers when they joined regular physical activities (Akyol & Ilkim, 2018). The study of Yağmur et al. (2020) recruited 289 participants (123 male and 166 female) and examined parameters related to participants' physical activities in park and recreation areas in Ankara Province. As a result of the study, variables of gender, educational level, marital status and body mass index were found not to affect choice of recreation areas and physical activity participation but variable of doing regular sports affected choice of physical activity area and variable of age affected frequency of participation in physical activities. Sportive activities were classified under three themes: sportive activities on province and country level and families, sportive activities provided by central and local authorities. Demands from local authorities of the families having a disabled child are reported to be barrier-free-living and barrier-free-sportive activities, information activities, elimination of the problems in common living places, allocation of social and sportive places to the disabled individuals and increasing the number of recreative activities (Yağmur, Eroğlu, Çağla, & Iconomescu, 2020). Pamuk's study (2021) focused on 20 families with disabled children in Malatya Province, exploring their expectations and demands from local authorities regarding the participation of their children in physical activities, with a focus on accessible living and inclusive sports. The findings revealed three main themes: the availability of sports activities, the accessibility of sports activities at the provincial and national levels, and the services offered by central and local authorities to families. As the result of our study; demands from local authorities of the families having a disabled child for barrier-free-living and barrier-free-sportive activities are information activities, elimination of problems in common living places, allocation of social and sportive places to the disabled individuals and increasing the number of recreative activities organized (Yağmur, Eroğlu, Çağla, & Iconomescu, 2020; Güner, 2021). In Erbaş et al.'s (2021) study, the researchers examined the constraints that prevent disabled individuals from accessing recreational activities in urban areas. They conducted a literature review using keywords such as 'recreation', 'leisure time', 'disabled' and 'physical activity' focusing on relevant studies. The study identified environmental and structural factors as the most significant constraints for disabled individuals. This conclusion was drawn in light of factors such as psychological and emotional factors, economic factors, and legal/procedural factors. To eliminate these constraints, solutions about physical environments were recommended (Erbaş, Gümüş, & Talaghir, 2021).Although there are numerous studies done with different populations in terms of participation in recreation areas (Ayhan, Ekinci, Yalçın, & Yiğit, 2018; Erbaş et al., 2021; Sarol, 2017; Yağmur et al., 2020), there are no studies on the families of the children with special needs.

Can recreation areas, which are strategically important for social improvement and inclusion, address all segments of society? This question serves as the motivation for this study, which was designed to explore this very question. Based on this premise, the research questions were formulated as follows:

1. What barriers exist for families with children with special needs in participating in recreational activities?
2. Are there differences in these barriers based on gender and marital status?

MATERIALS AND METHODS

Participants

This study focused on reviewing barriers to participation in recreation areas among the families having children with special needs. To this end, 555 voluntary parents who were selected using a suitable purposive sampling method from Mersin Province between 2020 and 2021 were included in the study. 414 of the parents were female participants while 141 of them were male participants. Data collection tool was consisted of two parts. In the first part, questions to address participants' various demographic information such as gender, marital status, age groups and health perception were asked. This study followed ethical standards and received approval from the Mersin

university social and human sciences ethics committee with reference number (Ref: 2023/3 Date: 05. march. 23). Participant provided informed consent, with the volunteer form covering research details, risks, benefits, confidentiality, and participant rights. The research strictly adhered to the ethical principles of the Declaration of Helsinki, prioritizing participant's rights and well-being in design, procedures, and confidentiality measures.

In the second part, Scale of Participation Barriers to the Use of Recreation Area (SPBURA) (Gümüş et al., 2017) was used to measure the constraints that prevented parents from participating in park and recreation areas. SPBURA has five subscales –safety barrier, individual barriers, sports area barrier, time barriers and friend barriers- and 17 items. SPBURA is a five-point rating scale (1: strongly disagree, 2: disagree, 3: undecided, 4: absolutely agree, 5: strongly agree). SPBURA was developed using the similar previous studies in the literature.

Statistical Analysis

To analyze the data; in addition to the descriptive statistics- t-test (which is one of the parametric tests) was used to compare averages of two independent groups in the normal distribution while one way variance analysis was used to analyze three or more groups. Exploratory (inferential) statistical findings were calculated over 555 participants in order to test significance of the subscale differences in terms of different variables obtained from the participating parents. cronbach's alpha values for the scale are: The safety barrier 0.91, the time barrier 0.82, the friends barrier 0.86, the sports area barrier 0.87, the individual barriers 0.84 and total scale 0.85. The explained variance ratio of the scale is 71.234.

RESULTS

Table 1 demonstrated the participants' distributions as to such variables as gender, marital status, age groups and health perception.

Table 1. Participants' Demographic Information

Variables		n	%
Gender	Female	414	74.2
	Male	141	25.8
Marital Status	Married	460	83.5
	Single	95	16.5
Age groups	22-35	122	22.1
	36-49	155	26.8
	≥50	278	51.1
Health perception	Bad	86	15.5
	Normal	374	68.6
	Good	95	15.9
Total		555	100

In Table 1, it is seen that 74.2% of the participating individuals were female. 83.5% of them were married while 16.5% were divorced or widow individuals. 51.1% of the participants were aged ≥ 50 years and 68.6% of them defined health status as normal. Data as to the participants' average scores and standard deviations obtained from subscales of Scale of Participation Barriers to the Use of Recreation Area were presented in Table 2.

Table 2. Participants' barriers for participation in recreation areas

Subscales	$\bar{x}$	Sd
Sports area barrier	4.01	1.51
Individual barriers	3.34	1.32
Time barriers	2.89	1.03
Friend barriers	2.56	.83
Safety barrier	2.43	.76

According to statistical findings about the subscales of "Scale of Participation Barriers to the Use of Recreation Area" and about the factors that prevented the families from participating recreation areas; "sports area barrier" subscale ($\bar{x}$=4.01) was in the first place as a barrier; followed – respectively- by "individual barriers" subscale ($\bar{x}$=3.34), "time barriers" ($\bar{x}$=2.89), friend barrier ($\bar{x}$=2.56), safety barrier ($\bar{x}$=2.43) subscales. Correlations between the subscales of Scale of Participation Barriers to the Use of Recreation Area and participants' gender variable were presented in Table 3.

Table 3. Participants' t-test results according to gender

Variables			Sd	t	p
Sports area barrier	M	3.89	.32	1.122	.026*
	F	3.08	.43		
Individual barriers	M	3.22	.73	1.612	.044*
	F	2.67	.53		
Friend barriers	M	2.33	.68	1.876	.043*
	F	2.05	.69		
Time barriers	M	3.65	.75	2.356	.013*
	F	2.43	.34		
Safety barrier	M	3.59	.65	2.453	.031*
	F	3.05	.34		

*p<0.05

When Table 3 was investigated, because of the independent groups t-test analyses performed to determine whether or not the participating individuals' barriers for participation in recreation areas differed in terms of gender; it was noted that gender was a variable that caused a significant difference in all subscales (p<.05). Male participants' average scores were higher than those of female participants.

Correlations between the subscales of Scale of Participation Barriers to the Use of Recreation Area and participants' marital status variable were presented in Table 4.

Table 4. Participants' t-test results according to marital status

Variables		n	$\bar{x}$	Sd	t	p
Sports area barrier	Married	460	3.08	.33	1.341	.038*
	Single	95	3.85	.43		
Individual barriers	Married	460	3.21	.19	2.174	.027*
	Single	95	3.66	.27		
Friend barriers	Married	460	2.23	.34	1.792	.031*
	Single	95	2.98	.56		
Time barriers	Married	460	2.43	.37	2.145	.027*
	Single	95	3.07	.55		
Safety barrier	Married	460	2.04	.35	2.392	.029*
	Single	95	3.18	.61		

*p<0.05

When Table 4 was studied, as a result of the independent groups t-test analyses performed to determine whether or not the participating individuals' barriers for participation in recreation areas differed in terms of marital status; it was identified that marital status was a variable that caused a significant difference in all subscales (p<.05). Single participants showed higher average scores than those of married participants.

DISCUSSION

In the study in which 555 parents who were recruited using a suitable purposive sampling method from Mersin Province joined the study, barriers to participation in recreation areas that families having children with special needs were experiencing were investigated.

In the statistical findings about the subscales of "Scale of Participation Barriers to the Use of Recreation Area" and about the factors that might have prevented the families from participating in recreation areas; "sports area barrier" subscale ($\bar{x}$=4.01) was in the first place as a barrier; followed –respectively- by "individual barriers" subscale ($\bar{x}$=3.34), "time barriers" ($\bar{x}$=2.89), friend barrier ($\bar{x}$=2.56), safety barrier ($\bar{x}$=2.43) subscales and the study of Shields et al. (2012) reported that barriers were insufficient facilities, poor transportation infrastructure, capacity of the programs and personnel, economical cost, lack of information and skills, preferences of the children, fears, parental behaviors and negative attitudes towards the disabled. On the other hand; the facilitators of these barriers were children's motivation to be active, practical skills, peer participation, family support, accessible facilities, proximity of the location, better opportunities and skilled personnel (Shields, Synnot, & Barr, 2012). As a result of the study of Steinhardt et al. (2021); it was also found that both facilitators and barriers differed among the individuals and generally depended on their living areas (Steinhardt, Ullenhag, Jahnsen, & Dolva, 2021). In the study of Rimmer et al. (2004) that was done to determine different facilitators and barriers to the disabled people's participation in fitness and recreation programs/facilities; ten different themes were established: barriers and facilitators related to the built and natural environment, economical issues, emotional and psychological barriers, equipment barriers, barriers related to the use and interpretation of guidelines-codes-regulations and laws, information-related barriers, professional knowledge, education and training issues, perceptions and attitudes of persons who are not disabled-including professionals, policies and procedures both at the facility and community level and availability of resources. As a result of the study, they identified that participation degree among the disabled people was affected by multi-factorial barriers and facilitators related to these people (Rimmer, Riley, Wang, Rauworth, & Jurkowski, 2004). As observed by these studies, different factors may be regarded as both barriers and facilitators depending on the person and the situation.

As a result of the study, it was found that the main factor that prevented families having children with special needs from participating in park and recreation areas was sports area barrier. When studies that have been conducted on recreation barriers are looked into, the subscale of sports area barrier has been listed in the last position (Demirci, 2019; Durhan, ÖzdemİR, & Karaküçük, 2021) but has been ranked on the top in the studies done with families having children with special needs; which indicates that park and recreation areas are not suitable for these special children to do sports. If this information is taken into consideration when new recreation areas are built or the old ones are renewed, new opportunities will have been offered to the families having children with special needs so that they can use them more. There are many studies that have emphasized the importance of physical activity and exercises in special children and their families (Finnvold, 2018; Haney, 2014; Jinnah & Stoneman, 2008). It is in local authorities' charge to provide necessary infrastructure so that special children can use rehabilitative and therapeutic strength of exercises and physical activities.

In sum, park and recreation areas are very important for children with special needs and their families. No matter what age they are at, children with special needs and their families should benefit from the integrative and valuable role of recreation areas as much as other people. To use recreation areas effectively and productively is crucial to the health and psychological development of the children with special needs. Families that achieve social integration in recreation areas will be able to make healthier relations with both family members and non- family members by getting rid of loneliness.

Recommendations

Different barriers were identified in the study of participation barriers to recreation areas experienced by the families having children with special needs. Meanwhile, many studies have been done to explore what these barriers are and how they can be eliminated. Particularly, considering the fact that each institution separately makes great efforts and works a lot to cope with the same

barriers, it is more important to establish a special institution that is responsible -only- to inspect leisure time activities for children with special needs. Barriers that children with special needs experience are not new but what is necessary is that helpful and useful interventions to improve some of these barriers or to eliminate these barriers are needed. Guiding should be given to identify what strategies are necessary in order to maximize opportunities by identifying these barriers properly. A special care should be given when policies, programs or interventions are implemented for the children with special needs and their families in the developing countries. The importance of building a special institution that is responsible for inspecting leisure time activities for children with special needs is very big. There is a need to investigate and to implement effective methods so that families can be better informed of the benefits of physical activities. Through mobile applications and smart technologies, parks and recreation areas that are designed according to the degree of the disability of the children with special needs should be more accessible for the disabled and should continuously be renewed according to the quality standards. Qualified personnel who will provide the children with special needs with psychological support and encourage them to use recreation areas during social adaptation process should be employed for recreation areas. On certain days of the week, group exercise programs and effective cultural and artistic activities should be held for the children with special needs together with qualified personnel. Public transport vehicles that go to recreation areas should be designed in a way for the children with special needs to use them.

Conflict Of Interest

No potential conflict of interest relevant to this article was reported.

Ethics Statement

The study was approved and supervised by the departmental research committee, Palestine Technical University - kadoorie (Ref: 2023/3 Date: 05. march. 23). Also the current study involving human participants was approved and obtained ethical permission from them.

Author Contributions

Study Design: HG,MK; Data Collection: HG,MK and EYB; Statistical Analysis: HG and MK; Data Interpretation: HG,MK and EYB; Manuscript Preparation, HG,MK and EYB; Literature Search: HG,MK and EYB. All authors have read and agreed to the published version of the manuscript.

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International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

Effects of a Six-Week Aerobic Exercise Training Program on Lipid Profiles in Sedentary Women

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Abstract
This study investigated how a six-week training program involving aerobic exercise affected the lipid profile of women who were sedentary. Using the pre-test post-test model, 36 sedentary female volunteers aged 18-29 years participated in the study. After the participants had fasted overnight, healthcare professionals took blood samples from them both before and after the training program in a clinical setting. Measurements were taken of triglyceride, high-density lipoprotein (HDL), low-density lipoprotein (LDL), and total cholesterol. The data obtained was subjected to a paired-samples test using the SPSS 22.0 statistical program to compare the values before and after training. Effect sizes (Cohen's d) were used to clarify the levels of comparison. Statistically significant differences were seen in blood lipid levels (triglycerides, HDL, LDL, and total cholesterol) between pre- and post-training assessments ($p < 0.05$). This study found that a six-week aerobic exercise program significantly increased HDL cholesterol levels by 15.8% (from 46.66 mg/dL to 54.05 mg/dL, $p = 0.000$) and decreased LDL cholesterol levels by 15.7% (from 96.72 mg/dL to 81.52 mg/dL, $p = 0.000$) in sedentary women. The study adds to the growing body of evidence suggesting that aerobic exercise programs, such as spinning, can significantly improve lipid profiles in sedentary women, potentially reducing their risk of cardiovascular disease. Future research should incorporate control groups to strengthen these findings.

Keywords
Aerobic, Exercise, Lipid Metabolism

INTRODUCTION

Although the fact that technology is now available to almost everyone in their daily lives makes it possible to accomplish many tasks more easily, it has also led to reduced amounts of physical activity. Many health problems occur due to lack of exercise, especially as we age. These include obesity and cardiovascular disease, which develop due to excessive fat and weight gain. Exercise is the most effective factor in reducing these diseases (Goodyear et al., 2021).

Regular exercise can benefit the heart by positively affecting lipid and lipoprotein levels. It is known that exercise reduces total cholesterol, serum triglyceride and low-density lipoprotein (LDL) cholesterol and at the same time increases high-density lipoprotein (HDL) cholesterol. In particular, aerobic exercise not only changes lipoprotein concentrations quantitatively, but also causes positive changes in lipoprotein subgroups (Öğe, 2019; Assunçãovd, 2017). The value of regular physical exercise for aging healthily and its preventive effects on chronic diseases are indisputable (Costa, 2018).

Studies show that moderate-intensity regular exercise and long-term exercise positively affect lipid metabolism. Exercise increases HDL levels while decreasing blood levels of total cholesterol, LDL and triglycerides. In addition to these changes in blood lipid levels, it is well known that high blood pressure and diseases associated with obesity

Received: 18 January 2024 ; **Revised** ; 18 February 2024 ; **Accepted:** 03 May 2024; **Published:** 25 May 2024

How to cite this article: Yamaner, E., Demirkıran, B., and Özcan, E. (2024). I Effects of a Six-Week Aerobic Exercise Training Program on Lipid Profiles in Sedentary Women. *Int J Disabil Sports Health Sci*;7(3):564-569.https://doi.org/10.33438/ijdshs.1421711

also decrease with exercise (Lemura & Amdreacci, 2000; Fox, Smith, & Jones, 1999; Karagöz, 2016). Due to its contributions towards health, exercise is a fundamental factor in improving individuals' quality of life. In recent years, a great deal of attention has been focused on the positive impact on metabolic health of aerobic exercise. Having a sedentary lifestyle, taking insufficient exercise and a lack of physical activity can cause a number of health problems, including lipid metabolism (Dunstan et al., 2012; Mozaffarian et al., 2011; Barranco et al., 2019).

Lipid metabolism is an important biochemical mechanism that includes the processes of synthesis, transportation and storage of fats in the body. The levels of LDL and HDL play a critical role when assessing cardiovascular disease risk (Mohr et al., 2014; Rossi et al., 2016). In this context, understanding how aerobic exercise affects the lipid profile is important for protecting and improving cardiovascular health.

Spinning is an aerobic exercise accompanied by music that can be performed for fun as well as weight loss purposes and that intense stimulates various muscle groups (Caria et al., 2007; Tortop et al., 2010; Uzun, 2016). It is a form of high-intensity cardiovascular activity and is widely used for conditioning. Spinning classes involve taking part in dynamic exercise routine on special bikes and is performed in groups. It is thus positive effects on lipid metabolism are well established (Huang et al., 2022).

This research investigated how a six-week aerobic exercise program (spinning) applied to sedentary women affected lipid metabolism. It was thought that this study would shed light on these specific effects.

MATERIALS AND METHODS

This case study followed ethical standards and permission to carry out the study was received from the Istanbul Aydın University [09/2023]. The participants provided their informed consent through a "volunteer form" which explained the details of the research, its risks and benefits, the confidentiality of the participants and their rights. The research followed the principles laid down in the Declaration of Helsinki. Priority was placed on the well-being and rights of the participants when designing the study, and the necessary procedures were put in place to ensure confidentiality.

Participants

The study included 36 sedentary women (mean $_{age}$= 24.58±3.53; mean $_{height}$=166.08±3.21; mean $_{weight}$= 64.77±3.04; mean $_{bmi}$= 24.31±2.51) who had no health problems and who regularly attended a private sports center in Çorum province. A bioelectrical impedance analyzer (TANITA TC-418, USA) was employed to measure the participants' weight and percentage of fat. No specific nutritional program was followed by the participants for the study's duration. To ensure standardized metabolic conditions, participants were instructed to adhere to a 12-hour overnight fast prior to the spinning exercise session and subsequent blood lipid profile measurements.

Procedure

Before the research, the participants were asked if they had any health problems. Those with a history of cardiovascular disease, those with chronic diseases and those using continuous medication were not included. Furthermore, those participants who stated that they had done regular aerobic exercise in the last year were excluded. After these individuals had been removed from the study, the pretest data of 50 female participants were initially collected. However, 14 of these were excluded from the study because they did not complete the entire exercise program. Finally, the pre- and post-test measurements of 36 female participants were used for the statistical evaluation of the research.

Data Collection Tools

The participants engaged in 40 minutes of spinning exercises three times each week for a total of six weeks. Before and after these exercises they attended a pre-determined health facility in the morning after an overnight fast for blood measurements, which were taken on by qualified professionals in a clinical setting.

Blood Lipids Measurement

Blood samples were stored in the cold chain until a complete blood count was performed. LDL, HDL, total cholesterol and triglyceride values were obtained by measuring complete blood counts with a Beckman Coulter NGOS device (Turgut and Soylu, 2021).

Exercise Program

During the spinning exercises, high-tempo music was played and spinning movements were performed by an experienced trainer according to the speed of the music (Duda at al., 2014). The following training protocol was applied:

Table 1. Exercise Protocol

Exercise	Duration
Warm-up	10 min.
Spinning Bike Exercise	40 min. (40-70% of max HR) (Yoon et al., 2017).
Cool-down	10 min.
Stretching	5 min.

Statistical Analysis

In analyzing the data, descriptive statistics (mean and standard deviation) and the paired samples t test were employed using the SPSS 22.0 package program. In order to uncover the differences between the pre- and post-test values, the dependent groups t test (paired sample t test), which is one of the parametric tests, was employed. Effect sizes (Cohen's d) were used to compare pre- and post-test findings: (<0.20 = insignificant; 0.20–0.59 = small; 0.6–1.19 = moderate; 1.2–1.99 = large; ≥2.0 = very large) (Hopkins et al., 2009; Turgut & Soylu 2021). The margin of error was determined as 0.05.

RESULTS

Table 2. Participants' Physical Characteristics

	N	$\bar{x}$±SD
Age (years)	36	24.58±3.53
Height (cm)	36	166.08±3.21
Weight (kg)	36	64.77±3.04
BMI (kg/m²)	36	24.31±2.51

Table 3. Differences Between the Average Weight, Fat Percentage and Blood Parameter Values of the Participants Before and After Spinning Exercises

Measurement	N	Pre-test (mean)	Post-test (mean)	t	P	Cohen *d*	Effect
Weight (kg)	36	67.83±3.74	61.72±4.50	8.20	0.000**	1.47	Large
Fat Percentage	36	31.66±1.89	24.77±3.74	9.52	0.000**	2.32	Very Large
Triglyceride (mg/dl)	36	105.11±6.06	83.00±6.62	10.83	0.000**	3.48	Very Large
HDL (mg/dl)	36	46.66±3.93	54.05±2.61	-9.31	0.000**	2.21	Very Large
LDL (mg/dl)	36	96.72±2.66	81.52±3.39	31.08	0.000**	4.98	Very Large
Total Cholesterol (mg/dl)	36	163.86±6.76	138.08±3.04	20.13	0.000**	4.91	Very Large

DISCUSSION

This research investigated how a six-week spinning exercise program for sedentary women affected fat metabolism. The results showed that the program had a positive effect on the women's blood lipid levels (triglycerides, cholesterol, HDL and LDL). These findings demonstrate that there are clear, positive changes in lipid profile from aerobic exercise and match those of other research (Thompson et al., 2002; Kelley et al., 2005).

Huang et al. (2022) stated that it would be possible to use a 10-week HIIT spinning bike exercise program as a complementary treatment to alleviate chronic diseases, suggesting it be employed to improve the health of women within the framework of an educational health plan (Biçer and Kaldırımcı, 2010) applied aerobic and aerobic + weight exercises for one hour, three days a week for three months to 30 sedentary women whose average age was 41.8 years. They stated that HDL cholesterol increased significantly due to this program. Two studies found a notable decrease in

body fat percentage and weight in university students who participated in regular folk dance practice over a period of 12 weeks (Ünveren, 2006; Turğut et al., 2019). Furthermore, HDL cholesterol was also seen to increase in the current study.

Chavarrias et al. (2019) systematically reviewed previous studies on the benefits of spinning exercises. They observed that these exercises made positive contributions to the lipid profile in women. This review supports the findings obtained in this study. Kyrolainen et al. (2018) reached a similar conclusion in their study, observing a significant increase in the lipid profile HDL parameter levels in women who had undertaken spinning exercises. This shows that aerobic exercise can improve cardiovascular health by increasing HDL cholesterol levels. In addition, the adjusted effects on LDL cholesterol levels are also noteworthy. LDL cholesterol is a key marker linked to the possibility of cardiovascular disease (Smith et al., 2011). Sixteen weeks of aerobic exercise improved blood lipids, while there was also a positive change in and the antioxidant function in this study, which corresponded with prior results showing a decrease in blood lipids and positive effects on the ROS and MDA as a result of regular aerobic exercise (Devries et al., 2008). A review of the literature found that engaging in aerobic exercises regularly over a period of 16 weeks had positive effects in terms of physical condition, blood variables and body composition; these effects were noticeably larger in the group practicing spinning exercises than in the general cycling group. This echoes results that found that more energy is consumed by spinning than by cycling at the same intensity (THR, 40%-65%) (Dandanell et al., 2017). The results obtained in the current study lead to the conclusion that aerobic exercise is effective in reducing LDL cholesterol levels. This highlights how aerobic exercise can play a role as one aspect of a strategy to limit the risk of developing cardiovascular disease.

In another study conducted on women aged 35-40, it was observed that a spinning exercise program was also effective in reducing disorders related to metabolic diseases by reducing the serum asprosin level in overweight women (Nakhaei et al., 2022). These findings, demonstrating the positive effects of spinning, are in accordance with those of the current study.

Conclusion

Given the results of this study and other research with similar training protocols investigating the effects of aerobic exercise on females of different age groups, it can be said that such exercise is a significant factor in terms of preventing cardiovascular disease. This research found that a six-week aerobic exercise program (spinning) performed by sedentary women had positive effects on lipid metabolism. In accordance with these findings, it can be recommended that sedentary individuals take part in intensive spinning training as a strategy to improve parameters (cholesterol, triglycerides, HDL, LDL) that pose a risk to cardiovascular health. It was not possible to form a control group in the present study because it was difficult to monitor whether young female subjects were not exercising and were maintaining an inactive lifestyle. This is the main limitation of the study. For this reason, it is important to create control groups in future studies designed to assess what impact aerobic exercise has on lipid metabolism.

ACKNOWLEDGEMENT

We would like to thank the Laboratory of the Sakarya Training and Research Hospital.

Conflicts of Interest

The authors have no conflicts of interest to declare.

Ethical Statement

The research was conducted in strict accordance with the principles found in the Declaration of Helsinki. The safety and well-being of the participants were prioritized during the design and implementation of the study and measures were taken to ensure data confidentiality. Permission to conduct the study was obtained from the Ethics Committee of Istanbul Aydın University at the board meeting dated 2023/09 and numbered 05-10-2023. All participants provided their informed consent in writing. The consent form detailed the study's procedures, potential risks and benefits, data confidentiality measures, and participants' rights.

Author Contributions

Study Design, E.B.; Data Collection, EB, AF and IPW; Statistical Analysis, EB, AF and IPW; Data Interpretation, EB, AF and IPW; Manuscript Preparation, EB, AF and IPW; Literature Search, EB, AF and IPW. All the authors agreed on the final draft of the manuscript before submitting it for publication.

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International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

The Effect of an Aerobic Platform on A Number of Body Components in Obese, Overweight, and Normal Children at the Age of (10-12 Years)

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Abstract
The aim of this study is to evaluate the effect of aerobic training intervention on body components in obese, overweight and normal weight children aged 10-12 years. Methods: quasi experimental pretest / posttest study design was used. The research sample was deliberately chosen from the primary school students of the ninth Kuwait School for Boys for the academic year (2022-2023), whose number is (56) students, with (10) obese children and (23) overweight children And (23) normal children. Paired independent t test Analysis was used to test the effect of the intervention between pre- and post-training. Results: The intervention significantly improved body component measurements in children with obesity or overweight when the pre-test and post-test values were compared in the research; BMI ($p<0.001$); Fat M(kg) ($p<0.001$); It was determined that there was a statistically significant difference in TR Fat M ($p<0.001$). However, in the data below, he concluded that there was no statistically significant difference between the variables;TBW(L) ($p>0.05$); PMM(%) ($p>0.05$); TR FFM ($p>0.05$); TR PMM ($p>0.05$). Conclusions: aerobic training made a significant difference in body component indices among children aged 10-12 years with obesity or overweight. Programmed aerobic training interventions can be used to improve some body component indices in obese and overweight children.

Keywords
Aerobic Training – Obesity -Overweight - Somatic Components

INTRODUCTION

Interest has recently increased in global nutrition problems (thinness, overweight, and obesity), particularly obesity, because after it was considered a problem confined to high-income countries, it has witnessed a huge increase in low-income and middle-income countries.

Obese children and adolescents are at increased risk of early onset non-communicable diseases, including musculoskeletal disorders, and some types of cancer, especially heart and metabolic diseases. The premature and long-term burden of non-communicable diseases carries significant economic consequences (Hammond & Ruth, 2010). For example, a high-fat mass percentage increases the risk of hyperlipidaemia, hypertension, and insulin resistance and promotes a long-term chronic inflammatory state (Smith et al., 2001).

As a result, excess adipose tissue increases the risk of chronic cardiometabolic diseases, such as type 2 diabetes, metabolic syndrome, coronary heart disease, and stroke (Bass & Eneli, 2015; Busnatu et al., 2022).

In general, studies indicate that overweight children and adolescents are at increased risk of coronary heart disease and cardiovascular disease in adulthood. Multidisciplinary interventions are considered effective in reducing cardiometabolic risk factors in overweight children and adolescents. These approaches mainly focus on weight reduction

Received: 06 February 2024 ; **Revised** ; 03 March 2024 ; **Accepted:** 06 April 2024; **Published:** 25 May 2024

How to cite this article: Obaid, A.K.I., Othman, M.T., and Anaz, M.S. (2024). The Effect of an Aerobic Platform on A Number of Body Components in Obese, Overweight, and Normal Children at the Age of (10-12 Years). *Int J Disabil Sports Health Sci*;7(3):570-578.https://doi.org/10.33438/ijdshs.1432842

and lifestyle modification (Rajjo et al., 2017). It has been shown that cardiometabolic outcomes are significantly reduced with the decrease in weight and body mass index (BMI) following interventions based on modifying eating habits and physical activity levels. Specifically, exercise interventions in overweight children improve body composition by lowering body fat, blood sugar, and waist circumference (WC) (Busnatu et al., 2022; Özdemir, 2023). The dramatic increase in the prevalence of childhood obesity in the last decade has changed the view of childhood obesity, which is now considered a World Health Organization problem (Chin et al., 2007).

According to the World Health Organization, the prevalence of overweight and obesity among children and adolescents aged 5 to 19 years increased dramatically from 4% in 1975 to just over 18% in 2016. The increase occurred among both boys and girls. Equally, in 2016, 18% of girls and 19% of boys were overweight, while the proportion of obese children and adolescents aged 5 to 19 was only 1% in 1975. In 2016, 124 million children and adolescents (6% of girls and 8% of boys) were obese (WHO, 2021).

The majority of studies in overweight or obese children and adolescents have focused on aerobic exercise. These studies indicate that aerobic exercise has little effect on overall measures such as body weight and body mass index (BMI), but is usually associated with positive changes in body composition. . Aerobic exercise may reduce body fat, reduce the loss of lean body mass that typically appears during dietary energy restriction and mediate the accumulation of visceral adipose tissue, the latter being associated with cardiovascular risk in children (Owens et al., 1999).

Through the researcher's review of previous and similar studies, he noticed that the researchers focused on studying nutrition problems, including obesity and others, on how to get rid of weight by following a diet or training curricula, and not on how to codify appropriate exercises for this group to be a reliable database in the training and education process. This is in addition to the lack of coverage of the category that our current research dealt with, which is the category of obese, overweight, and normal children at the age of (10-12) years, as a study (Wong et al, 2008) that dealt with the effect of a twelve-week training program on aerobic fitness and body composition and blood lipids in obese males. And a study (Chumlea et al., 2007).

In which he dealt with an overview of the state of body water and the effects of body fatness and age in children and adults, and a study (Dezenberg, et al, 1999) that dealt with the body composition expected from anthropometric measurements in children before adolescence)
Through the foregoing, the current research aims to identify the effect of an aerobic platform on a number of physical components in obese, overweight, and normal children at the age of (10-12 years).

MATERIALS AND METHODS

Research Methodology

The researcher used the experimental method due to its suitability to the nature of the research. This survey research has followed ethical standards and received a certificate of research ethics feasibility from the Institute for Research and Community Service STKIP Pasundan Cimahi with Number 015 / LPPM. STKIP-Pas/ST.KL/IV/2022. Participant provided informed consent, with the volunteer form covering research details, risks, benefits, confidentiality, and participant rights. The research strictly adhered to the ethical principles of the Declaration of Helsinki, prioritizing participant's rights and well-being in design, procedures, and confidentiality measures.

Research sample

After the researcher identified the research sample consisting of children (males) at the ages of (10-12) years, obese, overweight and normal The research sample was deliberately chosen from primary school students of the ninth Kuwait School for Boys for the academic year (2022-2023) Their number is (56) students.
The first group: obese children:
The first experimental group consisted of (10) children aged 10-12 years.
The second group: overweight children:
The second experimental group consisted of (23) children aged 10-12 years.
The third group: normal children:
The third experimental group consisted of (23) children aged 10-12 years.

Devices and tools used

Treadmill electric treadmill (TMX425 Trackmaster 2004). American origin. Body

Composition Analyzer, model BC-418 MA, from TANITA. Medical Scale Detector, of American origin.

Data collection methods

The researcher used tests and measurements and means to collect data, which included the following:

Aerobic stress test (Bruce test)

Bruce test: This test found great popularity among pediatricians because it is suitable for measuring the efficiency of their circulatory system and respiratory system, so it was used by the researcher because it is suitable for the ages of the research sample.

Test objective: The test aims to reach (VO2max) in the laboratory, which is an effort based on gradient speed and incline.

Tools: Electric treadmill with speed and incline standard.

Preparation for the test: The laboratory performs a warm-up process for a period of (5) minutes by climbing on the treadmill and walking or light jogging at a speed of (6 km / h and an incline of 4%). Then a 5-minute rest period is given.

Test specifications: The test consists of seven stages, each stage has speed and incline, and each stage takes three minutes to perform (Adams, 2002).

Table 1. Shows the phases of Bruce's pneumatic stress test

Step	Time (min)	Speed (km/h)	Slope (%)
1	0.01	2.74	10%
2	3	4.02	12%
3	6	5.47	14%
4	9	6.76	16%
5	12	8.05	18%
6	15	8.85	20%
7	18	9.65	22%
8	21	10.46	24%
9	24	11.26	26%
10	27	12.07	28%

Anthropometric Measurements

Measurement of length (cm) and mass (kg)

The length and mass of the research sample were measured using a device (measuring height and mass) type (Detecto). After turning on the device and whistling it, the tester stands on the device with bare feet, and the measuring person moves the metal plate to touch the head of the tester. After installation, the indicator that represents the length of the tester in centimeters is read and measured to the nearest (0.5) centimeter. As for the mass measurement, after the reading is settled on the electronic screen The number represents the mass of the tester in kilograms and to the nearest (200) grams. Although the aforementioned device measures body weight, it was relied on to measure the weight by a body composition analyzer (Body Composition Analyzer) BC - 418 MA from the Japanese company Tanita used in the current study.

Measuring the physical components and its parts

The measurement was started after taking the following precautions

Not training for at least (12) hours before the measurement. Do not take any liquids or food before the start of the test for a period of 6 hours. Urinate before measurement. Washing the hands and bottoms of the feet and making sure they are free of water before stepping on the body composition analyzer. Taking off clothes (except for underwear) and any metallic material (watch-ring-).

The measurement steps were taken as follows

The variables were measured using the Body Composition Analyzer, as data is first entered into the computer, namely (height, gender, age, (day, month, year), weight of clothes). After that, the tester climbs onto the device (the weight is read minus clothes), and then a sign (000) appears on the screen of the device, after which the tester holds the handles, so that the device starts reading automatically.

The following measurements were chosen for the components and parts of the body

Body fat mass (kg) Fat Mass (kg) Fat M, Fat-Free Mass (kg) Fat-Free Mass FFM, Total Body Water (L) (TBW). Percent Muscle Mass (%) PMM, Trunk Fat Mass TR Fat M(k/g), TR FFM(k/g) Trunk Fat-Free Mass, Trunk Percent Muscle Mass (%)TR PMM

Aerobic training program

When designing the training curriculum, the researcher took into account the following points

Starting the training unit, by warming up to prepare the muscles of the body for work, for a period of (5) minutes. Using the jogging field as a tool for the enemy. Determine the intensity of the enemy in the interval training method, amounting to (50%-65%), which was suitable for the research sample, according to the (Karvonen) equation and the exploratory experiment. Determine the running time according to the intensity used and the pulse used, and according to the experimental experience and according to the number of heart beats of the required intensity. The training curriculum consisted of two intermediate courses, each intermediate course containing (4) Minor cycles, and the ripple movement of pregnancy was between minor cycles (3: 1). The curriculum included three training units per week. Controlling the training load in the training curriculum, depending on the intensity (50%-65%) of the maximum pulse, i.e. the gradual increase in intensity between the smaller sessions. Rest (intensity) The ratio of work to rest between one repetition and another in the low-intensity interval training method, negative rest depending on time until the pulse returns 120-130 z / d between repetitions and 90-100 z / d between exercises, and the rest time was determined by Experimental path. Finish the training unit by performing calming and relaxation exercises.

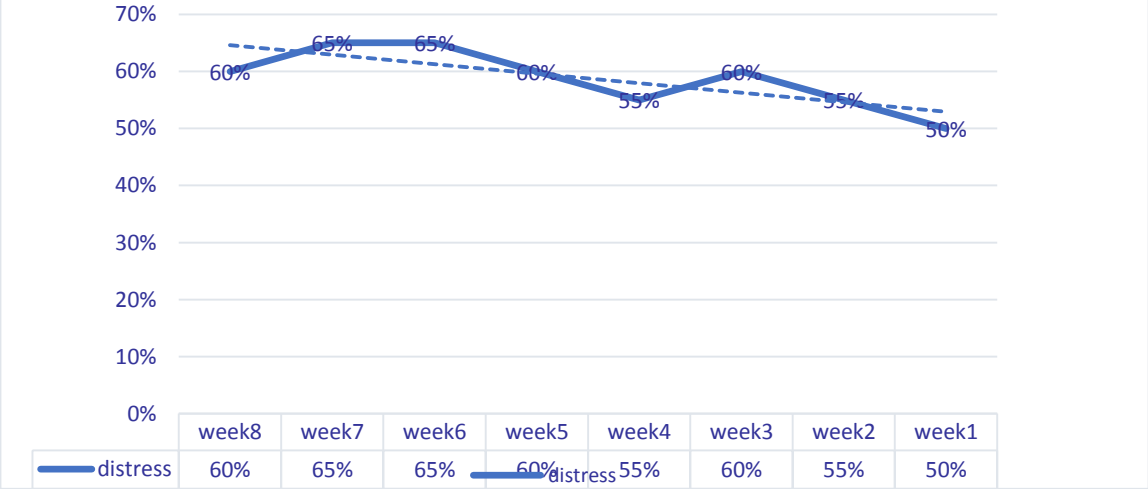

Figure 1. Shows a load movement for the aerobic training platform (intensity)

The main experience

Tribal measurements of body components and parts

For the purpose of achieving the objectives of the research, the researcher, with the help of the work team, conducted a Bruce test for aerobic effort on all members of the research sample for the period (7/1/2023-17/1/2023). The experiment was conducted according to the following sequence:

The examinee prepares for the test by wearing pants and sports shoes. A warm-up is performed by giving the tester (7-10) minutes, at a speed of (5-7) km/h, and an incline of (4-6) degrees on a treadmill. Give a rest period between the warm-up period and the start of the test (5-7 minutes) to return the functional variables to their normal state. Putting on the mask of the k5 device, after which the tester sits on a chair to take pre-measurements of the functional variables, then the subject gets on the treadmill. The lab begins to perform Bruce's test. The test continues with an increase in speed and incline until the tester reaches the stage of exhaustion. The test is stopped by pressing stop test. The data is stored automatically.

Points considered in the final experiment:

For the purpose of adjusting the research experience, the researcher took into account the following points

Wearing a tracksuit and athletic shoes on the day of the experiment. Before measuring the value of (REE) at rest, the amount of food and its calories must be taken into account, and in order to avoid this matter, the measurements were taken in the morning and on fasting for (8-12) hours and after measuring the body components. Conducting the test at a normal temperature (20-22) C by controlling it through air conditioning devices (heating and cooling). To ensure that all members

of the research sample are exposed to the same period of time between the warm-up and the start of the test, the warm-up process was arranged in a cross-work manner so that the time period between one tester and another is from (5-10) minutes (the experiment included two treadmills, one for warming up and the other for performing the test). The test procedure was taken under the same conditions in terms of place and time and in terms of the devices and tools used, as well as the sequence of functional measurements procedures for all members of the research sample. The researcher made sure that the work team is the same for all job measurements. As the experiment (pre-test) was conducted for the period from (7/1/2023-17/1/2023) at nine o'clock in the morning, the pre-measurements of the three research groups were conducted, which included the aforementioned measurements using the Body Composition Analyzer from TANITA Corporation. The data was recorded electronically by the device and then extracted from the device in the form of an Excel file.

Application of the training curriculum

The aerobic training curriculum was applied (in both the low-intensity and continuous methods) Appendix (9) for the period from (1/20/2023) to (4/22/2023) on the research sample at the rate of 3 training units per week and two medium training sessions (each session lasted 4-week course), and the researcher took into account the scientific foundations and rules during the application of the curriculum and taking into account the fluctuation of pregnancy during the training period, and the individual differences between the sample members were taken into account according to the intensity ratio used throughout the training period, and the researcher stirred up the competitive spirit between the two research groups. The training units also included On two methods of low-intensity and continuous interval training to add a factor of fun, pleasure, love of work and commitment to the training curriculum, given that the samples are from children and to avoid boredom that appears as a result of continuing the exercise at the same pace, which was observed through the exploratory experiment.

Dimensional measurements

Post-measurements were conducted, which lasted from (24/4/2023) until (2/5/2023) after completing the implementation of the training curriculum for the three groups, which are similar to the pre-measurements of the experiment, with the help of the same work team participating in the pre-measurement, and using the same procedures that were implemented After taking the necessary precautions to perform the dimensional measurements on the Body Composition Analyzer from (TANITA).

Statistical means:

The data were statistically processed using an electronic computer, using a qualitative statistical bag (Spss.v.26, Excel).

RESULTS

Displaying the results of the differences between the pre and post measurements in the values of the variables of body components and its parts for the three research samples (obese - overweight - normal)

Table 2. It shows the degree of significance between the pre and post tests of the average values of the research variables for the obese research sample

Variable	Before the Program		After the Program		t	Sig
	Mean	SD	Mean	SD		
BMI	26.7300	1.32418	25.3700	1.42287	4.015	0.003
Fat M(kg)	21.1200	4.07153	16.6300	2.98293	5.027	0.001
FFM(kg)	34.5300	3.27484	36.2200	3.49660	-2.622	0.028
TBW(L)	25.2800	2.40083	26.5300	2.56690	-2.629	0.027
PMM(%)	33.1400	3.09631	34.7300	3.29344	-2.580	0.030
TR Fat M	9.5400	1.81794	7.5500	1.27126	4.803	0.001
TR FFM	18.9300	1.71727	20.0500	1.42224	-2.446	0.037

TR PMM	18.2500	1.65143	19.3300	1.37117	-2.413	0.039

When the pre-test and post-test were compared in the study, significant findings were detected in favor of the post-test in all parameters. According to the findings: BMI (t:4.015, p<0.01); Fat M(kg) (t:5.027, p<0.01); FFM(kg) (t:-2.622, p<0.01); TBW(L) (t:-2.629, p<0.01); PMM(%) (t:-2.580, p<0.01); TR Fat M (t:4.803, p<0.01); TR FFM (t:-2.446, p<0.01); TR PMM (t:-2.413, p<0.01).

Table 3. It shows degree of significance between the pre and post tests of the average values of the research variables for the overweight research sample

variable	before the program		after the program		t	Sig
	Mean	SD	Mean	SD		
BMI	22.6261	1.14225	21.6696	0.92168	5.541	0.000
Fat M(kg)	13.4565	2.63194	11.0913	2.32064	4.868	0.000
FFM(kg)	31.9304	5.14167	32.3565	4.52024	0.953	0.351
TBW(L)	23.3826	3.76813	23.6870	3.30458	0.929	0.363
PMM(%)	30.7087	4.85620	31.0913	4.26976	0.898	0.379
TR Fat M	6.3261	1.44575	5.1087	1.40839	4.074	0.001
TR FFM	18.4435	2.29264	18.5087	1.94303	0.299	0.768
TR PMM	17.7826	2.19227	17.8522	1.86544	0.339	0.738

When the pre-test and post-test values were compared in the research; BMI (t:5.541, p<0.001); Fat M(kg) (t: 4.868, p<0.001); It was determined that there was a statistically significant difference in TR Fat M (t:4.074, p<0.001). However, in the data below, he concluded that there was no statistically significant difference between the variables; FFM(kg) (t:0.953, p<0.01); TBW(L) (t:0.929, p>0.05); PMM(%) (t:0.898, p>0.05); TR FFM (t:0.299, p>0.05); TR PMM (t:0.339, p>0.05).

Table 4. It shows he degree of significance between the pre and post tests for the average values of the search variables for the normal research sample

variable	before the program		after the program		t	Sig
	Mean	SD	Mean	SD		
BMI	18.5652	1.290739	18.35652	1.242002	2.194009	0.039
Fat M(kg)	8.2870	2.087474	7.013043	1.46359	6.220107	0.000
FFM(kg)	27.6870	4.598548	28.54348	4.64081	4.94244	0.000
TBW(L)	20.2783	3.366676	20.90435	3.404873	4.98414	0.000
PMM(%)	26.6435	4.404319	27.43478	4.429304	4.85927	0.000
TR Fat M	3.7435	1.251844	2.921739	0.817956	6.274384	0.000
TR FFM	16.8957	2.26625	16.82609	2.126076	0.608709	0.549
TR PMM	16.2957	2.178506	16.22174	2.064187	0.716522	0.481

When the pre-test and post-test values were compared in the research; BMI (t:2.1940, p<0.001); Fat M(kg) (t: 6.220, p<0.001); TR Fat M (t:4.942, p<0.001), FFM(kg) (t:4.984, p<0.01); TBW(L) (t:4.859, p>0.05); PMM(%) (t:6.274, p>0.05); It was determined that there was a statistically significant difference in TR FFM (t:0.608, p>0.05). However, it was determined that there was no statistically significant difference between the variables only in TR PMM (t:0.7165, p>0.05).
affected the reduction of fats as fuel in children who suffer from overweight and obesity.

DISCUSSION

This study aimed to present the effect of an aerobic training on a number of body components in obese, overweight, and normal children at the age of (10-12 Years). Previous research supports that the aerobic training is one of the most valid instruments to reduce overweight and obesity in children (Chen et al., 2022) and adolescents, especially when exercise is included (Tessaris et al., 2021). Bharath et al. (2018), exploring the efficacy of aerobic exercise on visceral adiposity in a group of adolescent girls with obesity, showed that aerobic exercise reduced metabolic risk factors in obese adolescents. In line with these results, our study observed an improvement in BMI (Body Mass Index - Fat M (kg) Body Fat Mass - FFM (kg) Fat Free Mass - Total Water Volume TBW - Percentage of Muscular Mass PMM) %) - trunk fat mass TR Fat M - trunk fat free mass TR FFM - trunk muscle mass ratio (TR PMM) in all the boys groups.

In addition, other authors that studied the effects of mixed exercise in children showed that exercise interventions significantly improved several cardiometabolic risk factors, such as BMI. Through the findings of the researcher, it was found that there is a statistically significant difference in the variables BMI (body mass index - Fat M (kg) body fat mass - trunk fat mass TR Fat M). The researchers concluded that there were no statistically significant differences in the variables: FFM (kg) fat-free mass - total water volume TBW - percentage of muscle mass PMM (%) - fat-free mass of the trunk TR FFM - percentage of muscle mass of the trunk TR PMM).

In interpreting the results of the research on the effect of the exercises used on reducing the percentage of fat in obese and overweight people, the researchers believe that the moderate-intensity exercises that the researcher uses in his training depend on the muscle fibers of the body. Type 1, which is characterized by containing larger numbers of mitochondria and depends on O2 to produce energy, compared to type 2 fibers, and therefore the oxygen used to oxidize fats and use them as energy will be large, and this is what

The researchers attribute the reason to the effect of the aerobic approach used on fat mass, which led to the body relying on fats to produce the energy needed to perform the effort. Exercise, which also depends on fat to produce energy for a long time, and all of this contributes to losing excess weight (Vella, et al., 2002) The researcher also attributes the reason for the decrease in fat mass in the sample to the increase in fat oxidation resulting from the aerobic work used, as long-term exercises (medium aerobics) increase fat oxidation, and several factors contribute to this, including Increased mitochondrial density in skeletal muscle leading to oxidative stress, capillary vascularization through skeletal muscle, increasing fatty acid delivery into the muscle, increased L-carnitine, which facilitates the transport of fatty acids across the mitochondrial envelope, increased fatty acid transporter proteins (Veldre, 2001) indicated that the component that most changes in the components of the human body is the fat mass, which can range from (5% to approximately 50%) of the body mass..., and there has been an increasing scientific interest in the fat mass largely because of its relationship In the health condition, especially in children, as the most obvious fat mass is in the navel, pubic and iliac region, (Rahimi, 2006) stated that the effect of training for (12) weeks using moderate intensity leads to improving body composition and reducing fat mass for overweight individuals.

Previous studies (Lindholm et al., 2019). underlined the importance of body composition evaluation in aerobic training practice. However, anthropometric measures such as BMI and bodyweight alone have insufficient sensitivity for overweight and obesity treatment and management. Moreover, fat-free mass evaluation allows for the tailoring of an exercise treatment (Yoo, 2016). Our study did not observe statistically significant variations inthe percentage of muscle mass of the trunk TR PMM boys. Future studies of longer duration are needed to clarify these aspects, or it may be useful to influence the frequency and intensity of the workouts. Nevertheless, we

observed a significant decrease in resulting from the improved sample mean values of BMI, Fat M(kg), FFM(kg), TBW(L), PMM(%), TR Fat M, TR FFM variables associated with obese. Evidence shows that objective measures of physical performance and ability can predict later health problems. This is especially important in childhood, the stage of life where we lay the foundations for health in adulthood and old age. Our study has been well validated in 10-12 year old children and it can be said that aerobic training is an effective, fast and cheap way to prevent obesity.

Although a previous study reported that an aerobic exercise program resulted in impaired muscle conditioning of children and adolescents with obesity compared to their normal-weight peers (Han et al., 2018), other authors reported that TR Fat M, TR FFM). In the group of 10-12 year old boys, this exercise intervention was observed to improve the values of the variables (related to obesity). According to the results of this study, the approach based on the examination of body components may represent an effective tool for monitoring health and evaluating the effectiveness of an exercise program in children with overweight/obesity. Further studies with larger study populations will be needed to confirm and generalize the results of this study.

Conflict Of Interest

This research no conflict of interest. No financial support was received.

Ethics Statement

This survey research has followed ethical standards and received a certificate of research ethics feasibility from the Institute for Research and Community Service STKIP Pasundan Cimahi with Number 015 / LPPM. STKIP-Pas/ST.KL/IV/2022.

Author Contributions

Study Design, HAS and SY; Data Collection, HAS and AAAID; Statistical Analysis, HAS, AAAID; Data Interpretation, HAS and AAAID; Manuscript Preparation, HAS, SY and AAAID; Literature Search, AAAID, HAS and SY. All authors have read and agreed to the published version of the manuscript.

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Conclusions

In our study, improvements were observed in all body components in 10-12 year old boys. In our opinion, these results may be statistically and clinically significant. This aerobic exercise program has been proven to be health-effective for children with overweight/obesity. In the children the data showed improvement in all body component measurement values (BMI, Fat M(kg), FFM(kg), TBW(L), PMM(%),

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International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

The Impact of Plyometric Resistance Training Implemented During the European Championship Preparation on Athletic Performance: A Case Study of the Youth Boxing National Team

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Abstract
The purpose of this study is to examine the effect of plyometric resistance training applied to the Turkish National Junior Men's Boxing Team during the European Championship preparation process. A total of 14 athletes from the Turkish National Junior Men's Boxing Team volunteered to participate in the study. The average age of the boxers was 17.57±1.04 years, the average height was 172.28±5.7 cm, the average weight was 72.14±2.9 kg, and the average body fat percentage was 20.47±1.15%. Participants engaged in a plyometric resistance training program prepared and scheduled by the researchers throughout the preparation camp. Various physical and biomotor parameters of all boxers (weight, BMI, body fat percentage, Squat, vertical jump, reaction time, grip strength, 5-meter speed, 10-meter speed, 40-meter speed, flexibility included) were measured at the beginning and end of the camp. Statistical analyses of all data were performed using the SPSS 22.0 statistical package program. Normal distribution analyses were conducted using the Shapiro-Wilk Test. Wilcoxon Test was used for the pre-test and post-test comparison of Body Mass Index and weight values, while the paired T-test statistic was used for the pre-test and post-test comparison of body fat percentage, Squat, vertical jump, reaction time, grip strength, 5-meter speed, 10-meter speed, 40-meter speed, and flexibility values. A significance value of $p < 0.05$ was accepted. Statistically significant changes were observed between pre- and post-camp changes. In conclusion, we suggest that a well-designed plyometric resistance training program may positively contribute to the physical and biomotor parameters of national junior male boxers before an important tournament during a preparation camp.

Keywords
Sports, Box, Physical Activity, Pliometrıc Power, Resistance

INTRODUCTION

It is Boxing, one of the oldest combat sports known to humankind, continues to captivate a broad audience today. Its enduring popularity stems from its focus on precise strikes and proper posture, both statically and dynamically, which are essential for achieving peak performance and gaining an advantage over opponents (Lopes-Laval et al., 2020). Boxing is regarded as a defensive art that demands skill and unwavering dedication to excel. It is founded on the core philosophy of delivering punches while adeptly evading incoming strikes. The physical demands placed on boxers are unmatched when compared to athletes in many other sports (Bianco et al., 2013). In addition to sparring with a partner, essential components of boxing training include shadow boxing, bag work, sandbag training, skipping rope, and a variety of static and dynamic exercises aimed at honing fundamental motor skills. These activities collectively contribute to the rigorous and demanding nature of the sport (Söyler et al., 2021; Özkan & Kumak, 2023). One of the most

Received: 08 February 2024 ; **Revised** ; 05 March 2024 ; **Accepted:** 03 May 2024; **Published:** 25 May 2024

How to cite this article: Gürkan, A.C., and Aydın, A.S. (2024). The Impact of Plyometric Resistance Training Implemented During the European Championship Preparation on Athletic Performance: A Case Study of the Youth Boxing National Team. *Int J Disabil Sports Health Sci*;7(3):579-587.https://doi.org/10.33438/ijdshs.1433904

noteworthy and effective features that distinguishes boxing from other sports is its comprehensive engagement of the entire body during training sessions, fostering self-control, and cultivating a strong sense of self-confidence (Söyler & Çingöz, 2022). Given the dynamic nature of boxing matches, coaches must continuously refine and innovate training methodologies that emphasize motor skills development, aerobic and anaerobic conditioning, and muscular activities to provide valuable feedback. It is imperative to comprehend and strive to improve physiological capacities, particularly in individual sports that share similarities with boxing in terms of energy system utilization and cardiovascular response (Bruzas et al., 2014).

Indeed, physiological data, when examined within the context of sports, emerges as a vital instrument in crafting training protocols, maximizing athletic performance, and formulating strategic approaches for competitions (Sanchez Medina et al., 2010). In both boxing and other sports, performance hinges on various factors including power, anaerobic and aerobic energy capacity, speed, as well as neuromuscular functions such as technique, tactics, and psychology (Turner et al., 2011). Elite boxers meticulously prepare for matches by engaging in high-intensity training sessions (Amtmann et al., 2008). Due to its high level of dynamic and static attributes, boxing is considered a complex and highly demanding combat sport that can significantly impact certain physiological balances in the body (Satılmış et al, 2023). To achieve top performance in boxing, athletes today require a combination of various physiological, psychological, and biomechanical factors. Therefore, sports scientists acknowledge that effective methods and diverse approaches used in preparing elite athletes for competitions are more valid in modern sports understanding (Zileli and Söyler, 2018; Kayantaş and Söyler, 2020).

In the realm of sports science, research on resistance training has been a focal point, exploring its impact on body composition and its correlation with various physical parameters. In addition to physiological, psychological, and tactical considerations, body composition and the assessment of physical performance play pivotal roles (Söyler and Zileli, 2023).

Attaining peak athletic performance necessitates tailoring training regimens to the specific demands of the sport discipline. Nevertheless, physical fitness alone does not determine optimal training performance in sports. Several physical factors influencing training performance encompass height, weight, body composition, aerobic and anaerobic capacities, strength, speed, and flexibility, all of which are modulated by diverse training methodologies (Satılmış et al., 2023).

This study examines the effects of plyometric resistance training conducted during the preparation period for the European Championship on male boxing team athletes.

MATERIALS AND METHODS

Participants

This study involved 14 young male national boxers, with an average age of 17.57±1.04 years, heights of 172.28±5.7 cm, body weights of 72.14±2.9 kg, and body fat percentages of 20.47±1.15%.

Table 1. Baseline characteristics of the study subjects (n= 14)

	n	X	SD
Age (years)	14	17.57	.51
Height (cm)		172.28	6.63
Body Weight (kg)		72.14	4.38
Body Fat Percentage (%)		20.47	1.15

Mean(X), Std. Deviation (SD)

Procedures

Participants were provided with a minimum of 24 hours of complete rest before the assessment phase of physical parameter variables. They were explicitly instructed to refrain from using any medication or similar chemical substances on the day of testing and throughout the pre-test period. As part of the research application process, participants were briefed on the specialized program, which encompassed pre-testing and resistance training at the outset. Additionally, they were informed that tests would be conducted eight weeks later.

Warm Up Protochol

To ensure a safe and suitable preparation for the physical fitness tests, participants engaged in a standardized warm-up session lasting approximately 15 minutes. This warm-up routine comprised running, sprinting, multi-directional movements, and dynamic stretching exercises.

Ethics Statement

These participants were preparing for the Junior Men's European Championship while concurrently training in various boxing clubs. Ethical approval for the study was obtained from the Atatürk University Ethics Committee (Code: E-70400699-000 2200099753/ Date: 28.03.2022/ Decision: 37). Prior to enrollment, all volunteers were verbally briefed on the study's objectives, and written consent forms were duly obtained from each participant.

Data Collection Tools

Measurement of Height

Height measurements were obtained using a Holtain device from England. The measurements were taken with the individual's body weight evenly distributed on both legs, head positioned in the "Frankfort Horizontal Plane," arms placed by the sides of the body, and palms facing the thighs, while the participant remained barefoot (Piorkowski et al., 2009).

Body Weight and Body Fat Percentage

Body weight and body fat percentage were assessed utilizing a Tanita MC-780 body fat analyzer from Japan. These measurements were conducted in the morning prior to breakfast, following a period of fasting. Participants were attired in shorts and a t-shirt during the measurements. To ensure accuracy, any metal or ornamental accessories worn by the volunteers were removed. Subsequently, the participant being measured stood barefoot on the aluminum platforms of the analyzer while holding the hand electrodes. Prior to each boxer stepping onto the platform, the metal components of the platform in contact with the hands and feet were cleansed with a damp cloth (Khanna et al., 2006).

Vertical Jump

Participants underwent vertical jump measurements utilizing the Optojump Next® device developed by Microgate in Bolzano, Italy. Widely acknowledged for vertical jump testing, the OptoJump device has demonstrated validity and reliability (González -Badillo et al., 2017). During the active jump test, participants were instructed to squat as deeply as possible and subsequently execute a vertical jump with their hands free, knees fully extended, and body upright. Any separation of the hands from the waist or bending of the knees during the flight phase of the jump was deemed incorrect. For the Squat Jump test, participants were instructed to squat with their knees at a 90-degree angle and then execute a vertical jump without re-bending their knees. Bending of the knees during the flight phase of the jump was considered an incorrect movement. In the event of incorrect movements, the test was repeated. Vertical jump measurements were conducted twice, and the best result was selected for evaluation (Glatthorn et al., 2011).

Sit and Reach Test (Flexibility Test)

Participants begin by sitting on a flat surface with their legs extended and feet (barefoot) positioned against the Sit and Reach test box, which is placed vertically in front of the feet. With the trunk bent forward at the hips, participants attempt to reach forward with their hands in front of the body, ensuring that their knees remain unbent. They are instructed to reach as far forward as possible. At the furthest point reached, participants hold the position for 2 seconds, and the measurement is recorded. It is crucial to maintain straight knees throughout the test. The test is repeated twice, and the highest score achieved is recorded for evaluation (Arazi et al., 2014).

Reaction Time

Participants' reaction time was measured using a test device developed by Performanz, designed to assess upper extremity motor reaction and visual reaction levels while incorporating cognitive challenges. The device comprises 8 light switches and operates with a total of 24 stimuli, with 3 randomly illuminated lights on each reflector. The test starts and stops with the activation of the device (Franchini et al, 2019).

Speed

The transit times for 5m, 10m, and 40m were measured using the Fusion Sports Smart Speed Professional Performance photosels, with a chronometer system providing ±0.01 seconds precision (Zileli & Söyler, 2021).

Training Program

In the first phase, which lasted for the initial 4 weeks, each exercise was performed for 40 seconds, and the workouts were structured with 5 sets over 4 days per week. Moving into the 5th and 6th weeks, the program progressed to 6 sets over 5 days per week, with each set lasting 60 seconds. Rest periods between sets were set at 4 minutes. The exercises were performed in the following order: 1. Lunge (15 seconds on the right side, 15 seconds on the left side), 2. Burpee, 3. Jump Rope, 4. Push-up, 5. Plank, 6. Static Leg Raise, 7. Full Squat, 8. Jumping Jacks.

In the second phase, during the 7th and 8th weeks, the program intensified to 7 sets over 6 days per week, with each set lasting 90 seconds. Rest periods between sets remained at 4 minutes. The order of exercises, based on mixed work durations and repetition counts, was as follows: 9. Spinning (30 seconds), 10. Kettlebell Swing (20 reps), 11. Front Squat (10 reps), 12. Rope Slamming (30 seconds), 13. Deadlift (10 reps), 14. Kettlebell Lunge (20 reps), 15. Medicine Ball (10 reps on each side), 16. Bulgarian Bag Jump Squat (10 reps).

Table 2. Phases and variables of plyometric resistance training in boxing training program during the preparation period

	1st phase	**2st phase**	**3st phase**
Weeks	Weeks 1-4	Weeks 5-6	Weeks 7-8
Weekly Training Day	4 days	5 days	6 days
Rest Interval	4 minutes rest	4 minutes rest	4 minutes rest
Ex.Duration per Minute	40 seconds	60 seconds	90 seconds
Training Intensity	70%	80%	90%

Data Analysis

Statistical analysis of all obtained data was done by SPSS 22.0 statistical package program in computer. Normal distribution analyses were made with the Shapiro-Wilk test. Comparison of the pre-test and post-test scores of BMI and body weight data were analyzed by using the Wilcoxon Test. Comparison of the pre-test and post-test scores were analyzed by using the Paired T test. Significance value was taken as $p < 0.05$.

RESULTS

In this section of the study, statistical analysis results and interpretations of the data obtained are given.

Table 3. Physical characteristics of elite young male boxers (n=14)

	n	**X**	**SD**
Age (years)	14	17.57	.51
Body Height (cm)		172.28	6.63
Body Weight (kg)		72.14	4.38
BodyFat Percentage (%)		20.47	1.15

Mean(X), Std. Deviation (SD)

Table 4. Pre and post-training programme body composition and physiological parameters (n=14)

Parameters	Pre Test Mean (SD)	Post Test Mean (SD)	Std. Deviation Pre-post	t	P value
Body Weight (kg)	72.14	65.85	4.38-3.50	6.60	**.000***
Body Fat Percentage (%)	20.47	18.37	1.15-1.14	8.51	**.000***
Squat Jump (cm)	27.75	29.57	3.49-3.07	-3.4	**.005***
Vertical Jump (cm)	29.84	31.25	5.44-4.69	-2.5	0.24
ReaktionTıme (sn)	.51	.54	.85-.07	4.6.	**.000***
Grip Strength (left)	48.68	52.21	5.04-6.00	-7.0	**.000***
Grip Strength (right)	49.57	50.51	4.07-4.82	-2.0	0.62
5m (sec.)	1.47	1.14	.25-.12	4.90	**.000***
10m (sec.)	3.64	5.65	.34-.19	5.69	**.000***
40m (sec.)	5.65	5.10	.24-.11	7.45	**.000***
Flexibility (cm)	30.82	31.86	3.93-3.75	-4.2	**.001***

$p<0.05$

In terms of boxers' body composition, notable disparities were observed between pre-test and post-test assessments in body weight ($p=0.00$*; $p>0.05$). Similarly, significant differences were noted between pre-test and post-test measurements in body fat percentage ($p=0.00$; $p<0.05$). Upon

evaluating the p-values of the means, it becomes apparent that this discrepancy is favorable, indicating an improvement in post-test scores. Significant differences were observed between pre-test and post-test scores in Squat performance ($p=0.005$; $p<0.05$). Upon considering the p-values of the means, it is evident that this difference is positive, favoring the post-test score.

However, no significant differences were found between pre-test and post-test scores in Vertical Jump performance ($p=0.24$; $p>0.05$). Regarding grip strength, significant differences were identified between pre-test and post-test scores in left hand grip strength ($p=0.00$; $p<0.05$). Conversely, no significant differences were observed between pre-test and post-test scores in right hand grip strength ($p=0.06$; $p>0.05$). Considering the p-values of the means, it is observed that the difference in left hand grip strength is positive, favoring the post-test score. There were significant differences between pre-test and post-test scores in Reaction Time ($p=0.00$; $p<0.05$). Upon considering the p-values of the means, it is observed that this difference is positive, favoring the post-test score.

Similarly, significant differences were also found between pre-test and post-test scores in the 5-meter sprint ($p=0.00$; $p<0.05$). Again, upon examining the p-values of the means, it is observed that this difference is positive, favoring the post-test score. There were significant differences between pre-test and post-test scores in the 10-meter sprint ($p=0.00$; $p<0.05$). Upon considering the p-values of the means, it is observed that this difference is positive, favoring the post-test score. Similarly, significant differences were also found between pre-test and post-test scores in the 40-meter sprint ($p=0.00$; $p<0.05$). Again, upon examining the p-values of the means, it is observed that this difference is positive, favoring the post-test score. Additionally, flexibility exhibited significant differences between pre-test and post-test scores ($p=0.00$; $p<0.05$). Upon considering the p-values of the means, it is observed that this difference is positive, favoring the post-test score.

The aim of this study was to investigate the impact of plyometric resistance training on athletes undergoing preparation for the European Boxing Championship. Fourteen male national boxers, all active licensed athletes in the field of boxing, volunteered to take part in the study. Various parameters of the athletes were evaluated through pre- and post-tests, and the collected data were analyzed and assessed

DISCUSSION

The aim of this study was to investigate the impact of plyometric resistance training on athletes undergoing preparation for the European Boxing Championship. Fourteen male national boxers, all active licensed athletes in the field of boxing, volunteered to take part in the study. Various parameters of the athletes were evaluated through pre- and post-tests, and the collected data were analyzed and assessed.

Significant differences were observed between the pre-test and post-test results of body weight measurements among the athletes participating in the study ($p<0.05$). Specifically, statistical significance was noted in the body weight measurements of the national boxers involved in our study ($p<0.05$). At the commencement of the preparatory camp, the average body weight of the boxers was recorded as 72.14 kg, whereas the measurement at the conclusion of the camp indicated an average of 65.85 kg (Table 3). Body weight stands as a pivotal factor contributing to athletic success, particularly in the sport of boxing (Davis et al.,2014). Notably, significant discrepancies in body weight values before and after a twelve-week training program, as applied to boxers with world and European rankings at the national team level, have been reported in previous research (Finlay et al., 2023).

In a study conducted on female boxers, it was observed that female national team boxers experience more rapid weight loss compared to professional handball players (Chaabène et al., 2015). Additionally, Savaş and Uğraş (2004) investigated the effects of an eight-week preseason training program on the physical and physiological characteristics of male collegiate boxers. They reported a decrease in body weight from an average of 78.33±12.26 kg to 75.67±10.61 kg (Savaş and Uğraş, 2004). Our findings align with the existing literature. The effects of plyometric resistance training implemented during the preparation camp preceding the championship, along with the controlled management of boxers' weight during this period, could elucidate these results.

A significant reduction in body fat percentages was observed among the national team boxers participating in our study ($p<0.05$). Upon

examining the body fat percentage values of the national team boxers before the preparation camp, it is noted that the average body fat percentage decreased from 20.47% to 18.37% after the preparation camp, indicating a positive improvement (Table 3).

Contrastingly, Pala and Savucu (2011) reported in their study that there were no statistically significant differences in the average body fat percentage of the boxing group before the camp (12.32%) compared to after the camp (12.33%) (Pala and Savucu, 2011). Additionally, in a study comparing various physical parameters of national female boxers with professional handball players, it was found that the boxers had an average body fat percentage of 9.61% (Usher and Babraj, 2024).

In their study examining the effects of an eight-week preseason training program on the physical and physiological characteristics of university male boxing athletes, Savaş and Uğraş (2004) reported that the average body fat percentage decreased from 12.86±2.37% to 12.72±2.87%. When compared to elite boxers, the average body fat percentage of the Turkish Boxing National Team was found to be 16.76%, the Ukrainian Boxing National Team's average body fat percentage was 13.40% (Chaabène et al., 2015), the Azerbaijan Boxing National Team's average body fat percentage was 10.29%, and the Turkish Boxing National Team's average body fat percentage was 13.16% (Beyleroğlu, 1998). The disparities in the average body fat percentage values can be attributed to the fact that our study group consisted of youth female athletes.

When evaluating the squat performances of the national boxers participating in our study, a significant increase is observed ($p<0.05$). Upon reviewing the squat values of the national team boxers before the preparatory camp, the pre-test average increased from 27.75 to 29.50 after the preparatory camp, indicating a positive development (Table 3).

It is believed that the increase in squat performance among all athletes in the study resulted from the development associated with maximal strength within the plyometric resistance training included in the study. Plyometric training can be defined as an intermittent sport characterized by high-speed and power activity bursts (James et al., 2017; Brown et al., 2022). Therefore, plyometric resistance exercises are physiologically complex, involving a wide range of physical abilities (i.e., strength, power, speed, muscle endurance) and metabolic mechanisms (anaerobic and aerobic) during both training and competition (James et al., 2017). Elite-level boxers need to possess high levels of endurance, strength, and anaerobic power to utilize different foot techniques targeting the lower body effectively (James et al., 2016; Venckunas et al., 2022). These high physical and technical demands underscore the necessity of specialized strength and conditioning training programs for these athletes (Helms et al., 2017).

Boxing athletes heavily rely on the power generated from their legs to enhance upper extremity strength (Cid-calfucura et al., 2023). The three fundamental punches in boxing—direct punches, hooks, and uppercuts—each involve a triple extension where the ankle, knee, and hip extend to generate force from the ground. The athlete then transfers this force to the opponent by utilizing the kinetic chain, involving the trunk, shoulder, and arm joints to deliver punches. Our study results indicate a focus on different strength training on the lower extremities, which aligns with the necessity for this combination as demonstrated in studies by Cepulenas et al. (2011).

The study conducted by El-Ashker et al. (2004) showcased improvements in lower extremity strength and power values of boxing athletes after four weeks of strength conditioning training on seventeen active athletes at the competitive level (El-Ashker et al., 2004; Jukic et al., 2023). Our study results are consistent with the findings of this research.

The study results demonstrate a significant increase in vertical jump performance among the national boxing athletes who participated in our study ($p<0.05$). Upon examining the pre-training camp vertical jump values of national team boxers, it is observed that the pre-test average increased from 29.84 to 31.25 after the training camp, indicating positive improvement (Table 3). Explosive power serves as one of the performance indicators in strength-based sports like boxing (Omcirk et al., 2022). Vertical jump, particularly favored for assessing anaerobic power and capacity, holds great significance in boxing (Brindha and Nallavan, 2022). In a study involving elite boxers across different age groups (14-16 years), athletes

were reported to have vertical jump values of 29.88 cm (Paul et al., 2011). Kıyıcı et al. (2016) and Bayraktar (2013) reported vertical jump values of 23.78 cm in their study on the boxing field. Furthermore, in a separate study conducted on elite male boxers, it was noted that training outcomes on speed and vertical jump abilities resulted in a positive increase in vertical jump values (Kıyıcı et al., 2016 & Bayraktar, 2013). Serin and Taşkın (2016) explored the relationship between anaerobic endurance and vertical jump in boxing and handball players and discovered a significant relationship ($p<0.05$), indicating that as vertical jump performance increased, anaerobic performance also improved (Serin and Taşkın, 2016). Pala and Savucu (2011) reported the vertical jump (cm) parameter for the Senior Men's Boxing National Team as 43.05 cm before the camp and 44.55 cm after, with the increase being statistically significant. Similar studies conducted on national team boxers revealed vertical jump measurements ranging from 39.57 cm to 47.82 cm at different times (Pala and Savucu, 2011). Based on our study findings, we can infer that athletes had a productive training camp period, achieving an increase in vertical jump parameters as mentioned above.

Conclusion

In conclusion, the plyometric resistance training implemented with the junior male national boxing team athletes during the preparation phase for the European Championship proved effective in enhancing various abilities, particularly jump ability duration. The incorporation of exercises targeting leg strength and power abilities during training sessions likely contributed to this effect. Additionally, a reduction in reaction time was observed, which may be attributed to exercises targeting arm strength and power abilities post-training sessions.

Throughout the camp period, the plyometric resistance training significantly improved motor characteristics and reaction time in the human body physiologically. It was evident that the type of activity influenced these characteristics at different levels. The short-term enhancement in reaction ability, considered a major expected effect of the applied training, can be credited to the training effect.

Moreover, the training regimen proved effective in increasing flexibility, possibly due to the inclusion of strength-intensive exercises focusing on strength and active force-related jumps. However, no significant difference was observed in right hand grip strength abilities, which may be attributed to the minimal inclusion of maximal force exercises in the training regimen for boxers with already high grip strength.

Considering the preparation process for the European Championship and the diverse needs of the national team boxers in terms of skill acquisition, the plyometric resistance training conducted during the preparation camp was evaluated in conjunction with all variables. Based on the study results, it is believed that the training regimen is effective in improving overall athletic performance.

Limitations and suggestions

Within the limitations of the study, it is important to mention the sample size. Our study consisted of fourteen participants.

However, if larger sample sizes can be achieved, it would provide preliminary information for future studies with a broader sample. Finally, our study has practical implications. Coaches of boxing athletes may consider using plyometric resistance training-based exercises throughout the preseason leading up to competitions. These exercises aim to improve neuromuscular variables, which could consequently impact competition outcomes.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethics Statement

These participants were preparing for the Junior Men's European Championship while concurrently training in various boxing clubs. Ethical approval for the study was obtained from the Atatürk University Ethics Committee (Code: E-70400699-000 2200099753/ Date: 28.03.2022/ Decision: 37). Prior to enrollment, all volunteers were verbally briefed on the study's objectives, and written consent forms were duly obtained from each participant.

Author Contributions

Study Design, ACG, ASA, Data Collection, ACG, ASA; Statistical Analysis, ACG, ASA; Data Interpretation, ACG, ASA; Manuscript Preparation, ACG, ASA; Literature Search, ACG, ASA. All

authors have read and agreed to the published version of the manuscript.

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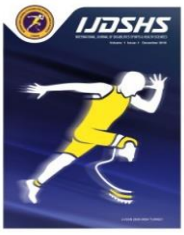

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

RESEARCH ARTICLE

Is There a Relationship between Low Back, Hamstring, and Ankle Flexibility with Rowing Performance in Elite Rowers?

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Abstract
The study aimed to evaluate the relationship between low back, hamstring, and ankle flexibility with rowing performance. The study included 26 male rowers (mean age: 16.72±0.73 years). All participants were assessed regarding the flexibility of the low back, hamstring, ankle, and rowing performance by sit and reach (Baltaci et al., 2003), weight-bearing lunge (Powden et al., 2015)., and 2000-m rowing ergometer performance time tests (Mikulić et al., 2009), respectively. No correlation was found between sit and reach and 2000-m rowing ergometer performance time test results. However, a negative correlation was found between ankle flexibility and 2000-m rowing ergometer performance time test results ($r= -0.39$; $p <0.05$). Additionally, 2000-m rowing ergometer performance time test result was negatively correlated with anthropometric variables and the training frequency of rowers in a week. The stepwise multiple regression analysis results indicated that only training frequency had a significant impact on the outcome variable. Conversely, weight, height, and ankle flexibility were insignificant predictors in the analysis ($R2 = .492$; $R = .39$, $p<0.05$). The training frequency plays a crucial role in influencing the outcome variable. Other factors, such as weight, height, and ankle flexibility, did not demonstrate significant associations. However, it is essential to note that the regression model only takes into account a medium level of variance. Future studies may examine the potential impact of other risk factors.

Keywords
Flexibility, Performance, Rowers, Sports, Male

INTRODUCTION

Rowing is a famous Olympic sport considered one of the most compelling endurance sports. A typical rowing competition hold out 2000, about 5.5–7.0 minutes, depending on the weather and boat type (Mäestu & Jürimäe, 2005). Rowing stroke comprises two main phases, including the drive, where the oar is propelled backwards by extending the legs and moving the upper body backwards, and the recovery phase, where the body returns to its initial position in preparation for the next drive. The rowing stroke, consisting of the recovery and drive phases, is repeated 200–250 times in a 2000-meter race (Hosea & Hannafin, 2012). Precise posture is not only the tremendous sport of rowing to improve the performance but also to avoid injury. Settling into a seated position, the rowers learn to put equal weight on the sit bones, thus keeping their balance while rowing. The rowers, then, tie their feet in the foot straps that forms a solid connection between their feet and the foot stretcher of the rowing machines. Catching requires a straight back and upright torso to maintain the core strength that will provide the spine support. Leaning forward from the hips is also needed to create the proper angle. With arms fully extended, the rower is ready to enter the drive phase that starts from a forceful leg push. With extending of the legs, there is a controlled lean back which brings the handle down to lower chest or upper abdomen. In the recovery, the detail of releasing the arms, bending the knees smoothly, and pivoting at the hip is particularly crafted to return to the catch

Received: 11 February 2024 ; **Revised** ; 05 March 2024 ; **Accepted:** 03 May 2024; **Published:** 25 May 2024

How to cite this article: Çil, E.T., Barlas, Y., Özlüer, D., Seçinti, C., and Yeral, A. (2024). Is There a Relationship between Low Back, Hamstring, and Ankle Flexibility with Rowing Performance in Elite Rowers?. *Int J Disabil Sports Health Sci*;7(3):588-596.https://doi.org/10.33438/ijdshs.1435151

position. As to rowers a neutral head position and rhythmic breathing are supposed to add to the subtle postural considerations contributing not only to the efficiency and performance, but also to the sturdiness of their rowing careers by lowering the risk of injuries (Secher & Volianitis, 2009; Soper & Hume, 2004;Rumball et al., 2005; Ogurkowska et al., 2015; Thompson & Wolf, 2016). The complete manifestation of rowers' performance largely depends on the synchronicity and efficacy of specific muscle groups used. The quadriceps, hamstrings, and gastrocnemius muscles constitute the powerhouse trio that provides the required power to move the boat forward. Meanwhile, the core muscles, including abdominals, obliques, and the lower back, act as true protectors of posture. They remain stable and resilient to the forces at work. The posterior muscles, such as the latissimus dorsi and rhomboids, which direct the paddle during the crucial phase of disengagement and contribute to maintain a desirable lean back, provide power as well as elegance to the stroke. The precision is advanced through the activity of shoulder and arm muscles producing controlled and accurate movements as well as targeting of the handle. The hip muscles including hip flexors and glutes work together to perform a smooth transition between catch and finish that generates the elegant stroke. In this subtle dance, leg adductors keep the body aligned, while the neck muscles help with a stable and neutral head position. That is why, the posture of a rower forms the basis of an excellent performance on the water or ergometer. As rowers get ready with the catch position, maintaining the straight and the upright torso, the engagement of core muscles not only supports their spine but also facilitates the transfer of power from the catch to the drive phase. Flexibility is a key factor in the process, allowing rowers to attain the necessary range of motion during each phase of the stroke. Flexibility of the body has this unique ability to make a smooth transition between the catch and the finish position resulting in a more powerful and efficient stroke. Additionally, inadequate flexibility in these areas could lead to the overexertion of muscles and joints in the spine and shoulders (Ettema et al., 2022;Buckeridge et al., 2015; Penichet et al., 2021;Stutchfield & Coleman, 2006).

In the literature, ıt has been shown that a lack of hamstring and hip flexibility may cause back and knee injuries in rowers rowers (Kasmi et al., 2017; Graham-Smith et al., 2007). To explain that, a term is used as a lumbopelvic rhythm represented by the pattern of a rowing stroke, which combines pelvic rotation with lumbar spine bending (Steer et al., 2006). Numerous studies indicated a significance of lumbopelvic coordination during rowing; rowers should prefer a complete range of pelvic movement rather than severe lumbar spine flexion to decrease stress on the spine (Bull & McGregor, 2000; Wilson et al., 2014). Therefore, Position the pelvis correctly throughout the stroke with adequate hamstring flexibility, reducing the need for additional lumbar movement (Smoljanovic et al., 2009). On the other hand, inadequate hamstring flexibility would restrict the pelvic range of motion and elevate lumbar spine involvement, particularly in the catch position.That is why, hamstring flexibility is a parameter that should be evaluated regarding rowers' performance as it affects the movement pattern during rowing (Weerts et al., 2019).

Another critical issue is the ankle flexibility of the rowers. There is a foot stretcher in the boat where the rowers put their feet, and it has been suggested that the more vertical foot stretcher leads to greater propulsive force on the boats. However, rowers' ankle flexibility can limit the shank and leg positions during the catch. More vertical foot-stretcher angle is supposed to greater dorsiflexion for the same amount of knee flexion. Because greater ankle flexibility allows the rower to relax, increase their speed and smoothness in and out of the water and thus maximize boat speed efficiency, foot stretcher angles, arranged based on the rower's flexibility, may provide athletes with enhanced performance while competing (Liu et al., 2020).

It has been proven in the literature that parameters such as power, balance, and endurance affect the performance of rowers. However, the findings examining the relationship between flexibility parameters and rowing performance are insufficient and the results are controversial, and the flexibility relationship of some regions is pathology dependent. In addition, to the best of our knowledge, there is no study in the literature that includes ankle flexibility (Stutchfield & Coleman, 2006; Graham-Smith et al., 2007). Knowing the relationship between lower extremities and low back flexibility with rowing performance is essential to focus on and improve the training programs to increase the rowers' performance, prevent injury, and sustain their sports careers for a long time. Therefore, this study aimed to investigate the relationship between lower

extremity flexibility, including low back, hamstring, and ankle flexibility, and 2000-m rowing ergometer performance time in elite male rowers.

MATERIALS AND METHODS

Study Group

The study included 26 male rowers (mean age: 16.72±0.73 years) who competed in the Turkish Federation ergometer race. Inclusion criteria determined elite rowers with at least three years of experience. Athletes were excluded from the study if they had any back and lower extremity injuries and pain and attended any rehabilitation program. The mean body height was 1.86 meters, with a SD of 0.05 meters. Heights ranged from 1.7 to 1.9 meters among the participants while a mean body weight of 77.64 kilograms, with a SD of 9.89 kilograms. Individual body weights ranged from 55.3 to 94.1 kilograms. On average, participants had 3.00 years of rowing experience, with a SD of 1.14 years. Rowing experience varied, with a range from 2.0 to 5.0 years. The mean training frequency was 16.60 hours per week, with a SD of 8.93 hours. Participants engaged in training for a range of 6.0 to 42.0 hours per week (Table 1).

Before the assessment, all rowers were informed about the evaluation process and signed the informed consent form. Parent-informed consent was obtained for athletes who were younger than 18 years. After the purpose of the study was explained to Turkish Rowing Federation and team coaches the athletes were asked for their consent.

Ethics Statement

This study was approved by the decision of the Marmara University Clinical Research Ethics Committee by the Declaration of Helsinki (protocol number 182). The clinical trial number of the study is NCT05771272.

Protocol

Before evaluation process, a pre-structured questionnaire was filled out through face-to-face interviews to get their physical features (age, body mass index, presence of chronic diseases, and training habits). After filling out the form, the participants performed three tests, including the sit and reach test, weight-bearing lunge test and 2000-m rowing ergometer performance time test on the same day. All athletes with lower extremity flexibility, including lower back, hamstring, and ankle, were assessed. The low back and hamstring muscle flexibility was evaluated by the 'sit and reach test,' and the ankle flexibility was measured by the 'weight bearing lunge test.' In order to evaluate the performance of rowers, 2000-m rowing ergometer performance time test results were recorded after the race.

Procedures

Firstly, the flexibility of lower extremity tests were performed. Then, a warm-up of 6 min at a 500 m split time of 2 min 30 s was performed by all rowers before the 2000-m rowing ergometer performance time test. All rowers rested for 6 min, during which time they performed stretching exercises. The time to complete 2000 meters in the quickest amount of time was calculated and displayed on the ergometer. On the Concept II ergometer, stroke-by-stroke power output was recorded and stored in a file. The mean power output and time-trial time were computed for each ergometer race. The Sit and Reach Test is one of the linear flexibility tests that helps determine how extensible the hamstrings and lower back are (Mayorga-Vega et al., 2014). It was first introduced in 1952 by Wells and Dillon and is likely the most used flexibility test. In a study, the test was used to measure the flexibility of rowers. The box measured 32 centimetres in height, 45 centimetres in width, and 35 cm in length; the box's upper surface was 15 cm longer than the area where the feet rested. The subject was positioned on the ground with both legs fully extended, separated by shoulder width, and flat on the box. The participants positioned themselves with one hand on top of the other, knees fully extended, stretched as far forward as they could, sliding their hands across the ruler's top, and kept that posture for at least two seconds. The end location of the fingertips on or approaching the ruler was measured in centimetres to get the sit and reach score. Higher scores showed improved performance. The best result was recorded after the test was run thrice (Baltaci et al., 2003).

The Weight-Bearing Lunge Test, also known as the Dorsiflexion Lunge Test, measures the ankle joint's dorsiflexion. With a tape measure on the floor, measure the distance from the big toe's end to the wall. It was done on both legs. The subject's foot was on the floor with the big toe and heel line aligned on the tape measure. Following that, identical methods were used to test the other leg. They made a lunging motion forward until their knee hit the wall. The untested leg may be rested on the floor, and subjects could grip the wall during the

test. To determine how close to the wall a subject could touch the wall with their knee while still keeping their heel in contact. The tape measure was then used to calculate the distance from the big toe's tip to the wall in centimetres. After the measurements, each participant's average of both legs was calculated (Powden et al., 2015).

Rowing performance was evaluated by a 2000-m time-trial on the Concept II rowing ergometer. The competitive racing setting was most likely where the rowers put their best effort. The rowers had to complete 2000 in the quickest amount of time. On the Concept II ergometer, stroke-by-stroke power output was recorded and stored in a file. The mean power output and time-trial time were computed for each ergometer race (Mikulić et al., 2009).

Table 1. The physical characteristics of the elite rowers (n=26)

Variables	Mean	SD	Range
Age (years)	16.72	0.7	16.0-18.0
Height (m)	1.86	0.05	1.7-1.9
Weight (kg)	77.64	9.89	55.3-94.1
Rowing experience (years)	3.00	1.14	2.0-5.0
Training frequency (hours in a week)	16.60	8.93	6.0-42.0

SD: Standard deviation

Data Analysis

Data were analyzed using SPSS version 26.0 and $p \leq 0.05$ was accepted as significance level. The degree of relationships between data variables is measured using correlation coefficients. Pearson correlation coefficients (r) were applied to determine the strength of each independent variable and their relationship to 2000-m rowing ergometer performance time test. A Pearson correlation coefficient, evaluated the the relationship of each independent variable with values range from -1 to 1 for a perfectly inverse, or negative, connection. Values close to zero suggest a lack of a linear relationship or an extremely weak association. The strength of the relationship is often described using the following values; If the coefficient value lies between ± 0.50 and ± 1, then it is said to be a strong correlation, If the value lies between ± 0.30 and ± 0.49, then it is said to be a medium correlation, when the value lies below + .29, then it is said to be a small correlation (Shober et al., 2018). After preliminary analysis, a stepwise multiple regression was conducted to examine the relationships between the predictor and outcome variables to identify the most significant predictors while controlling for other variables. The 95% confidence interval for β is accepted as the range of values for which a hypothesis test cannot be rejected at both the 5% significance level.

RESULTS

In this section of the study, statistical analysis results and interpretations of the data obtained are given.

The results of the anthropometric and flexibility parameter and their correlations with 2000-m rowing ergometer performance time test are shown in Table 2. There was a negative correlation between performance and anthropometric variables (height and body mass index) and training frequency. Although there was no correlation between sit and reach and 2000-m rowing ergometer performance time test results, ankle flexibility was negatively medium level correlated with 2000-m rowing ergometer performance time test results at the 0.05 significance level ($r = -0.39$; $p<0.05$). Additionally, 2000-m time is negatively medium level correlated with anthropometric variables (height and body mass index) and training frequency of rowers in a week (Table 2).

Table 2. Correlations of anthropometric and flexibility parameters with 2000-m rowing ergometer performance time test result

Variable	Correlation coefficient with E2000 * p
E2000 (s)	1
Age (years)	-.171 0.001
Height (m)	-.500 0.08
Weight (kg)	-.421 0.02
Body Mass Index (kg/m$^{2)}$	-,271 0.001
Rowing experience (years)	-.305 0.06
Training frequency (h)	-.469 0.03
Weight-Bearing Lunge Test (average of both ankles) (cm)	-.396 0.01
Sit and Reach Test (cm)	-.142 0.001

* Correlation coefficient: r, Correlation is significant at the 0.05 level (2 tailed): p. E2000: 2000-m rowing ergometer performance time test

Based on the stepwise multiple regression analysis results, the following variables were found to be significant predictors of the outcome variable: The training frequency increases, there is a significant negative effect on the outcome variable (The coefficient (Beta) =-0.382, t=-2.213, p=0.039). The other predictor variables, including weight, height, and ankle flexibility, were found to be non-significant predictors based on their p-values (p>0.05, the coefficient (Beta) for weight is -0.167, with a t-value of -0.719 and a p-value of 0.481; The coefficient (Beta) for height is -0.303, with a t-value of -1.377 and a p-value of 0.184; The coefficient (Beta) for ankle flexibility is -0.228, with a t-value of -1.270 and a p-value of 0.219). These findings suggest that weight, height, and ankle flexibility do not significantly affect the outcome variable. Therefore, in the stepwise multiple regression analysis, only training frequency was a significant predictor of the outcome variable, while weight, height, and ankle flexibility did not have a significant impact (Table 3).

Table 3. Stepwise multiple regression with 2000 m performance as the response variable

Variables	**B**	**SE**	**β**	**t value**	**p value**
Constant	889.288	225.072		3.951	**.001***
Weight	-.615	-.856	-.167	-.719	.481
Height	-193.579	140.615	-.303	-1.377	.184
Training Frequency	-1.554	.702	-.382	-2.213	**.039***
Ankle Flexibility	-2.129	1.677	-.228	-1.270	.219

* = statistically significant; B unstandardized coefficient; β=standardized coefficient; SE= Standard Error ; R^2 = .492; R = .39, significance level set at <0.05

DISCUSSION

The current study aimed to investigate the relationship between the hamstring, lumbar region, and ankle flexibility of rowers' and their 2000-m performance. The study provides valuable insights into the factors influencing 2000-m rowing ergometer performance. Ankle flexibility,

anthropometric variables (body height and body mass), and training frequency all play roles in determining performance outcomes. Notably, the results highlight the significance of consistent training, as evidenced by training frequency emerging as the primary predictor of rowing performance.

Performance in rowing is affected by a variety of factors (Baudouin & Hawkins, 2004). Limited results have been sought in the literature for rowing performance and performance-related parameters. Physical fitness parameters are widely used to predict the performance characteristics of athletes in various sports. However, many factors determine performance in rowing (Mäestu & Jürimäe, 2005). Some of these factors are power, balance, endurance, and strength (Akça, 2014). Anthropometric measurements and parameters such as flexibility are essential factors in rowing performance. Identifying the strengths and weaknesses of the rowers in advance, which may affect their performance, is an important factor that determines the performance of the athletes in their matches (Soper & Hume, 2004). A rower's body composition has been indicated to be significant in determining performance (Ackland et al., 2012). The study by Bourgois et al., (2000) showed that elite junior male rowers have taller, more comprehensive, and girthier dimensions than a normative reference group of people their age. Since these differences in anthropometric measurements affect performance, the elite group of young male rowers found significant differences in length, width and circumference dimensions, and body mass between finalists and non-finalists (Bourgois et al., 2000). The study conducted by Kılınç (2008) reached the following conclusion: the group with high rowing performance had a height difference of 5.9 cm and a body weight difference of 2.7 kg more than the other group. It has been concluded that physical structure is effective in the rowing performance of puberty boys, especially extremity length and circumference values, which affect performance positively (Kılınç, 2008). In another study conducted on rowers aged between 12-13, higher levels of rowing performance were positively correlated with body size, particularly with sizeable lean body mass, including weight and height (Mikulić & Ryzic, 2008). The results in the literature showed that these results are consistent with our study findings. The current study revealed that 2000-m rowing ergometer performance time test result was negatively correlated with anthropometric variables. These findings imply that specific body features impact rowing performance, especially 2000-m ergometer performance. Therefore, when selecting adolescents for rowing teams, coaches may pay attention to those with large body sizes regarding height and weight.

Although the current studies report that exercise frequency does not affect muscle strength overall, it is essential for improving training programs. As the level of athletes increases, manipulation of training variables becomes more essential. One of the methods is that when the training level increases is to correspondingly increase the total weekly volume. This can be done differently by increasing load, weekly sets, and repetitions per set (Kraemer & Ratamess, 2004). When the total weekly sets for an athlete increase, it might be advantageous to spread volume over several training sessions, as suggested by Hartman et al. (2007). Exercising at a high volume per session can be less beneficial for maximizing muscle adaptations due to muscle fatigue. Thus, it can be effective to split the total training volume into several training sessions throughout the week to prevent potential increases in the fatigue of muscles (Johnsen & van den Tillaar, 2021). Based on these findings, our study also confirms this theory. This study revealed a negative correlation between training frequency and 2000-m rowing ergometer performance time, indicating that a higher frequency of training sessions was associated with improved performance in elite male rowers.

In a study conducted by Howell (1984), it was found that athletes with higher lumbar flexion flexibility may reach further forward and have a more extensive range of motion available to them to produce power throughout the drive. Moreover, Reid and Mcnair (2000) concluded that low back pain and decreased performance in rowers are also caused by restrictions in hamstring flexibility and joint hypermobility. On the other hand, our findings showed that no correlation was found between sit and reach test results and 2000-m time. The flexibility of the participants' hamstring and lower back does not significantly influence their performance in the 2000-meter rowing ergometer test. This finding implies that other factors, such as muscular strength, endurance, or technique, may play more prominent roles in influencing the

participants' rowing performance over the specified distance.

As far as we know, no results for the relationship between 2000-m rowing ergometer performance time test and flexibility results specially for ankle flexibility in rowers were investigated in the literature. Our study found no significant relationship between hamstring, lumbar region and 2000-m rowing ergometer performance time. According to the literature, it has been determined that ankle flexibility can be effective in the performance of rowers, although there has yet to be a consensus in the literature. Soper and Hume (2005) examined the mechanics of rowers, power output, and the performance duration on the 2000-meter race ergometer, explicitly focusing on altering the foot stretcher angle. In the study, the power output improved when the foot-stretcher angle was increased from 36° to 46°. So, these results may imply rowers with better performance thanks to greater dorsiflexion (Soper & Hume, 2005). Our findings related to ankle flexibility demonstrated similarity that ankle flexibility results were negatively correlated with 2000-m rowing ergometer performance time test result at the 0.05 significance level ($r = -0.39$; $p < 0.05$). This means the rowers with greater ankle flexibility perform better in the 2000-m rowing ergometer performance time.

Limitations and clinical implications

The study was performed in 26 males rowers which is a relatively small sample which might restrict the generalizability of the finding. In the subsequent research, different gender and larger samples can be used. The study design is cross-section, which does not permit the establishment of causal relationships between the variables. Longitudinal research designs in future studies will allow an in-depth analysis of the intricate changes over time. The research was also not designed to determine the specifics of the rowers' training routines. Differences in the mode of training, such as intensity, duration and specific exercises may influence the observed connections. Further studies may potentially involve more detailed evaluations of training programs. Even with a few limitations to the study, there are still a number of clinical consequences of it. The investigation highlights it is the training frequency that determines the rowing performance in this regard. Coaches and players are able to use this or knowledge in a way of designing training programs targeted on a daily and nightly basis or even during weekends. While the ankle flexibility brought about only a slight drop in regression scores, its correlation with hesitation still indicates that the attention to the ankle flexibility would not be essentially in vain. Moreover, ankle flexibility could be included in the training schedule to be not the only target. Clinicians, physiotherapists, and coaches ought to approach the performance of rowers in a comprehensive manner rather than the lack of emphasis on a single biological or anatomical factor such as flexibility. This research may well be perceived to be a requirement for any training programs multi-directional evaluation for rowers, the induction process as well as the continuing education. According to the study, additional research can reveal various other risk factors and variables which could prove to be key contributors to solve the rowing performance problem. Addressing impact of psychological aspects, dedicated to technique perfection, and attentive to nutritional issues might result in a better comprehension of the factors that predetermine the success.

Conclusion

Greater ankle flexibility, larger body size, weigh, height, and weekly training frequency positively affect the 2000-m rowing ergometer performance time test in elite male rowers. Body weight and height are important factors that can be considered in sport-specific selection criteria. In addition, ankle flexibility is another parameter that can affect 2000-m performance time in elite rowers. Identifying these factors mentioned in elite rowers may be an effective strategy to increase performance. For this reason, we recommend that factors such as body size and ankle flexibility be considered before and after the season in rowers, and these parameters should be evaluated and followed to increase performance.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethics Statement

This study was approved by the decision of the Marmara University Clinical Research Ethics Committee by the Declaration of Helsinki (Protocol number 182).

Author Contributions

Study Design, ETÇ; Data Collection, YB, DÖ and CS; Statistical Analysis, YB and DÖ; Data Interpretation, ETÇ, YB and DÖ; Manuscript Preparation, ETÇ, YB, DÖ CS and AY; Literature Search, ETÇ, DÖ, YB, CS and AY. All authors have read and agreed to the published version of the manuscript.

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International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

Comparison of The Physical Fitness Parameters of Special Education Vocational School Students and Inclusion High School Students

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Abstract
This study compared the physical fitness parameters of intellectually disabled special education vocational school students with those of inclusive high school students using the causal comparison method. Participants consisted of 22 (15 male, 7 female) from Special Education Vocational School and 25 (20 male, 5 female) inclusion students receiving inclusive education at high school. A physical fitness form was used to collect data on body mass index (BMI), standing long jump, flexibility, right-hand reaction, left-hand reaction, leg strength, back strength, right-hand grip, left-hand grip, 30 m sprint, and push-ups. The T-test was applied to data exhibiting normal distribution, while the Mann-Whitney U test was used for data not normally distributed. Among the parameters showing normal distribution, there were significant differences between the two different student groups in the standing long jump, flexibility, left-hand reaction, leg strength, and right-left hand grip strength. Although a significant difference was observed in the right-hand reaction, no significant differences were detected for the other non-normally distributed parameters of BMI, back strength, 30-m sprint, and push-ups. Our results indicated that students with intellectual disability (ID) enrolled in inclusive education at the high school level performed better in all physical fitness tests conducted compared to their peers in special education vocational schools.

Keywords
Special Education Vocational School, Inclusive Education, Intellectual Disability, Students With Special Needs, Physical Fitness

INTRODUCTION

Intellectual disability (ID) is defined as a significant limitation in both mental functions and adaptive behaviors pertaining to numerous daily, social, and practical skills (APA, 2022). Early diagnosis and placement are crucial to support these deficiencies and to enable those with ID to benefit from an educational environment best suited to their needs. Following a medical diagnosis of ID in Turkey, an educational evaluation is conducted by the Guidance Research Centers and individuals are placed in the most suitable educational environment. Such settings include special education schools, special education vocational schools, and inclusive schools where students with ID can receive an inclusive education with their typically developing peers. Multiple transitions occur in the educational lives of individuals with ID, including moving from kindergarten to elementary school, elementary to middle school, middle school to high school, and entering adult life. Prior to reaching adulthood, high school education is as critical as the other educational levels. Upper secondary education should support the goal of jobs for all by providing qualifications and guidance for either admission to higher education or entry into employment (Gustavsson et al. 2021). Students with ID may enroll in special education vocational high schools if they do not sufficiently benefit from inclusive education. In such educational settings, individuals with ID are

Received:13 February 2024 ; **Revised** ; 22 February 2024 ; **Accepted:** 03 May 2024; **Published:** 25 May 2024

How to cite this article: Han, M., Akaydın, Ş., Yılmaz, A., and Koç, S. (2024). Comparison of The Physical Fitness Parameters of Special Education Vocational School Students and Inclusion High School Students. *Int J Disabil Sports Health Sci*;7(3):597-607.https://doi.org/10.33438/ijdshs.1436311

expected to focus on obtaining skills related to employment or daily life (Wendelborg et al. 2017).

In Turkey, both inclusive and special education vocational schools exist for individuals with mild ID in the transition from secondary school to high school, a transition that is at once necessary and critical. During this period, greater independence is encouraged while the child undergoes physical changes and prepares for adult life (Lane et al. 2015; Mandy et al. 2015). Studies have reported that inclusive high school students with ID are afforded much less attention (Lightfoot & Bond, 2013; Bouck, 2012). Most of the research on transition for students with ID focuses primarily on out-of-school transition or early childhood (Marshall et al. 2018; Bouck, 2016). In addition, the number of studies on the physical fitness of children with ID in high school are limited (Bossink et al. 2017). The less active lifestyles led by individuals with ID (Skowronski et al. 2009) are reflected in their physical fitness levels, which negatively affect their adult life skills (Cuesta-Vargas & Pérez-Cruzado, 2014; Vargas et al. 2022). Physical fitness, defined as the capacity of an individual to perform work, is one of the factors that determines effective functioning in life skills in addition to having a significant impact on health (Bibro & Żarów, 2021). To be considered physically fit, one must possess the ability to actively execute daily tasks without feeling tired as well as the necessary energy to spend one's free time in joyful pursuits (Gallahue et al.2014; Baltacı, 2016). For this reason, it is important to assess the physical fitness levels of individuals with ID at the high school level, the last stage before the transition to adult life. By examining the effects of physical education programs applied in accordance with the curricula of two different types of schools on the physical fitness of students with ID within the scope of this research, we can achieve greater understanding of the physical fitness levels of these individuals, thus contributing to the literature on this subject.

Physical education and sports programs are assumed to contribute to the development of individuals' physical fitness and to improve the efficacy of their adult life skills, with suggestions in alignment with the desired results. The focus of the present study was the comparison of the physical fitness parameters of students with ID attending special education vocational school students versus those in inclusive high schools, in an attempt to answer the research question "Is there a difference between the physical fitness levels of the students according to the type of school?. The answer to this question will not only provide information about the physical fitness levels of individuals with ID educated in different types of schools but also hopefully generate ideas for future research as well as for policymakers, thanks to the suggestions that emerge.

MATERIALS AND METHODS

In this study, the causal comparison research method, a type of quantitative research design, was employed.

Participants

A total of 47 students with mild intellectual disabilities educated in schools affiliated with the Ministry of National Education in the 2021-2022 academic year were included in the study. While 22 of these students (7 girls, 15 boys) attended special education vocational schools between the ages of 16-21 (mean: 17±1.3), the other 25 students (5 girls, 20 boys), with ages ranging from 13-18 (mean: 15 ±1.4), received inclusive education in high schools located in the city center.

Data Collection Tools

Ethical approval for this study was granted by the directorate of the Scientific Research and Ethics Committee of Muş Alparslan University (document date and number 01.03.2022-42225). Parental consent was obtained in writing from the families of the students included in the study. Information regarding the participants was gathered from the relevant special education classroom teachers and school administration. The physical fitness parameters of the participants were measured and entered on the Physical Fitness Test Information Form and the following data were collected for each study participant.

Age, Body Weight, and Height

The ages of the students participating in the study were recorded by referencing the official records of the institutions they were attending. Their weights were measured using a Fakir brand electronic scale with a capacity of 150 kg and a sensitivity of 0.01 kg, with the students removing their shoes prior to being weighed. Measurements were taken with the head held upright, the soles of the feet flat on the scale, the knees stiff, heels together, and the body in an upright position. The results obtained were recorded in the Physical Fitness Test Information Form in kilograms. For the

height measurements of the students, they were instructed to stand without shoes, with the heels close, body and head upright, and eyes facing forward. When the sliding caliper apparatus touched the head, the height value obtained was entered in cm in the Physical Fitness Test Information Form (Lange et al. 2021).

Body Mass Index (BMI)

Body mass index (BMI) was calculated by dividing the body weight (kg) of the students participating in the study by the square of their height (m) (Krause et al. 2016).

Standing Long Jump

The participants' feet were placed on a starting line and they were instructed to jump forward as far as possible by pulling their arms back and leaning their torso forward. The students were directed to fall on both feet with their arms in front, and the distance between the starting line and the point where their heels contacted the ground was then measured. Two trials each were performed and the score was recorded in cm. According to the scoring in the evaluation scale, the farthest distance jumped by each participant was scored between 0-12 (Logan et al. 2017).

Flexibility (Sit-Reach) Test

The sit-and-reach test was used to measure flexibility. Students were directed to remove their shoes and place the soles of their feet on the support section of the flexibility board. They then reached forward with both arms without bending their knees, pushing the ruler on the flexibility board slowly with their fingertips, extending as far as possible for 1-2 seconds. The test was repeated twice and the best result was recorded in centimeters in the Physical Fitness Test Information Form in centimeters (Fiori et al. 2020).

Right-Left Hand Reaction Time Test: New Test 1000

During this test, the students and the tester sat opposite each other at a table opposite each while the tester guided the student by giving them the necessary information. The instrument used in this test measures visual or auditory simple reaction time and visual selective reaction time. The number of alerts can be adjusted and each alert interval occurs randomly. The test environment was free of possible environmental effects that could impair the student's ability to concentrate during the test. The test was performed with the student's hands on their knees and in an upright position while observing the stimulus relayed by the tester. Prior to evaluating each student's measurements, three attempts were made to measure the reaction times. The visual and auditory reaction times for each hand were then measured, with three repetitions allowed for each. The best score for each was recorded (Mayda et al. 2016).

Measuring Back and Leg Strength

The Takei digital dorsal leg dynamometer (model TKK 5402, Takei Scientific Instruments Co. Ltd., Tokyo, Japan) was used to evaluate back and leg strength. To measure back strength, the students first fixed their feet on the dynamometer board, while their knees and arms remained taut. They then gripped the dynamometer firmly in their hands, with their backs straight and torsos bent slightly forward. The measurement was completed by pulling the dynamometer bar vertically upwards utilizing maximum power. During the measurement of leg strength, the students' knees were slightly bent and their feet were fixed on the dynamometer board. They held their arms taut and brought their backs and trunks to an upright position while the dynamometer bar was firmly attached. Finally, they lifted the dynamometer vertically with maximum force using their leg strength, thus completing the measurement. Following 3-5 minutes of warm-up, each strength measurement was repeated 3 times and the best results were recorded. The relative strengths of each measurement were subsequently calculated (Senturk et al. 2021).

Right-Left Hand Grip Force

A Takei brand Hand Grip 5401 hand dynamometer, which measures strength from 0-100 kg, was used to determine grip force. The dynamometer was first adjusted to fit the students' hands, then their arms were extended straight at a 10-15 degree angle from the shoulder. The students were instructed to squeeze the dynamometer with maximum force while standing upright, with their arms at their sides but not touching the body. Two measurements were made separately each for the right and left hands, and the best result for each was recorded in kg in the Physical Fitness Test Information Form (Guidetti et al. 2010).

Speed Measurement

To assess the speed of the participants, the 30-m sprint test was employed. Prior to the start of the test, a distance of 30 m was measured. At the starting line, the students assumed a crouching position and were instructed to run with maximum power until reaching the finish line. A Casio brand stopwatch was used to measure their speed. Each

student was allowed two attempts, with the time for each sprint measured using two different chronometers (the average time of the two chronometers for each attempt was considered a single measurement). The fastest time was then recorded in the Physical Fitness Test Information Form (Battaglia et al. 2013).

Push-Up Test

The push-up test was used to determine the upper extremity strength and endurance of the students. When performing this movement, the students were positioned facing the floor, with their arms stretched and their fingertips touching the floor. The students were asked to bend their arms at the elbows and direct their torsos toward the ground. The number of times the students were able to perform push-ups with maximum strength was recorded on the Physical Fitness Test Information Form (Guidetti et al. 2010).

Data Analysis

In this study, the SPSS 22.0 statistical package program was used to analyze the data. Prior to analyzing the data, a normality test was performed. The T-test, one of the parametric tests, was employed for data exhibiting normal distribution, while the Mann-Whitney U Test, a nonparametric test, was used for non-normally distributed data. A value of $p < .05$ obtained from the analyses was accepted as statistically significant, and the findings were arranged in tables.

RESULTS

This section presents the findings of the statistical analyses of the data obtained in the study.

Table 1. Statistical distributions for inclusion students

Parameter	Min.	Max.	X_{median}	Standard Deviation
Age	13.00	18.00	15.8000	1.41421
Height (cm)	149.00	188.00	166.3200	10.74213
Weight (kg)	36.00	105.00	57.9200	14.31759
Body Mass Index (BMI)	14.79	31.35	20.7420	3.61910
Standing Long Jump	95.00	195.00	146.3200	25.08107
Flexibility	4.00	33.00	16.2000	7.42181
Right-Hand Reaction	.38	1.11	.5253	.14502
Left-Hand Reaction	.32	.60	.4936	.07670
Leg Strength	24.50	141.50	60.4600	30.59477
Back Strength	20.50	100.50	54.5800	23.35847
Right-Hand Grip	13.20	48.00	28.8760	9.21278
Left-Hand Grip	13.80	44.60	28.5040	8.64858
30-m Sprint	4.54	8.04	6.3744	.84967
Push-Ups	1.00	20.00	9.8800	5.42617

Table 1 shows the descriptive statistics pertaining to the age, height, weight, and BMI of the inclusion students with mild ID, together with the following physical fitness parameters: the standing long jump, flexibility, right-hand reaction, left-hand reaction, leg strength, back strength, right-hand grip, left-hand grip, 30-m sprint, and push-ups.

In Table 2, the descriptive statistics for age, height, weight, and BMI of the students with mild ID attending special education vocational school are presented, as well as data on their physical fitness parameters, including the standing long jump, flexibility, right-hand reaction, left-hand reaction, leg strength, back strength, right-hand grip, left-hand grip, 30-m sprint, and push-ups.

Table 2. Statistical distributions for special education vocational school students

Parameter	Min.	Max.	X_{median}	Standard Deviation
Age	16.00	21.00	17.7273	1.38639
Height (cm)	143.00	183.00	164.0455	10.25149
Weight (kg)	40.00	112.00	63.2273	18.84001
Body Mass Index (BMI)	17.91	37.65	23.3518	5.98536
Standing Long Jump	44.00	166.00	105.7273	33.99325
Flexibility	1.00	28.00	10.5455	7.00834
Right-Hand Reaction	.22	1.26	.8438	.26154
Left-Hand Reaction	.56	1.53	.8345	.24130
Leg Strength	20.00	80.50	41.5227	16.90765
Back Strength	21.00	62.00	42.7955	15.03461
Right-Hand Grip	12.00	34.90	23.0745	6.45600
Left-Hand Grip	7.06	34.09	23.5518	7.59502
30-m Sprint	4.74	10.45	6.1482	1.40563
Push-Ups	1.00	24.00	9.0455	8.19685

Table 3 presents the results of the Mann-Whitney U test performed to determine whether significant differences existed between students with mild ID enrolled in special education vocational school versus those who inclusive schools in terms of the following parameters: BMI, right-hand reaction, back strength, left-hand reaction, 30-m sprint, and push-ups. A statistically significant difference was found in favor of the students receiving inclusive education with respect to right-hand reaction (U = 76.000, $p < .05$). However, no statistically significant differences were observed for BMI (U = 209.500, $p > .05$), back strength (U = 205.500, $p > .05$), 30 m sprint (U = 192.500, $p > .05$), or push-ups (U = 229.500, $p > .05$).

Table 3. Mann-Whitney U test comparison of physical fitness levels of students by education type

Parameter	Education Type	n	Mean Rank	Sum of Ranks	U	z	*p*
Body Mass Index (BMI)	Special Education Vocational Students	22	26.98	593.50	209.500	1.397	.163
	Inclusion Students	25	21.38	534.50			
Right-Hand Reaction	Special Education Vocational Students	22	33.05	727.00	76.000	4.247	**.000***
	Inclusion Students	25	16.04	401.00			
Back Strength	Special Education Vocational Students	22	20.84	458.50	205.500	1.482	.138
	Inclusion Students	25	26.78	669.50			
30-m Sprint	Special Education Vocational Students	22	20.25	445.50	192.500	1.759	.079
	Inclusion Students	25	27.30	682.50			
Push-Ups	Special Education Vocational Students	22	21.93	482.50	229.500	.973	.331
	Inclusion Students	25	25.82	645.50			
	Total	47					

*$p < .05$

In Table 4, the results of the t-test conducted to detect significant differences in the standing long jump, flexibility, left-hand reaction, leg strength, right-hand grip, and left-hand grip strength of students with mild ID attending special education vocational school compared with those in who were inclusived are given. Statistically significant differences were found in favor of the students receiving inclusive education for standing long jump ($t(47) = 4.695$, $p < .05$), flexibility ($t(47) = 2.675$, $p < .05$), left-hand reaction ($t(47) = 6.699$, $p < .05$), leg strength, ($t(47) = 2.576$, $p < .05$), right-

hand grip (t(47) = 2.467 $p < .05$) and left-hand grip (t(47) = 2.073 $p < .05$)

Table 4. T-test comparison of physical fitness levels of students by education type

Parameter	Education Type	n	x̄	s	sd	t	*p*
Standing Long Jump	Special Education Vocational Students	22	105.727	33.99325	45	4.695	**.000**
	Inclusion Students	25	146.320	25.08107			
Flexibility	Special Education Vocational Students	22	10.5455	7.00834	45	2.675	**.010**
	Inclusion Students	25	16.2000	7.42181			
Left-Hand Reaction	Special Education Vocational Students	22	.8345	.24130	45	6.699	**.000**
	Inclusion Students	25	.4936	.07670			
Leg Strength	Special Education Vocational Students	22	41.5227	16.90765	45	2.576	**.013**
	Inclusion Students	25	60.4600	30.59477			
Right-Hand Grip	Special Education Vocational Students	22	23.0745	6.45600	45	2.467	**.017**
	Inclusion Students	25	28.8760	9.21278			
Left-Hand Grip	Special Education Vocational Students	22	23.5518	7.59502	45	2.073	**.044**
	Inclusion Students	25	28.5040	8.64858			
	Total	47					

*$p < .05$

DISCUSSION

In individuals with intellectual disabilities, certain deficiencies in areas of motor development may also be observed (Tomaz et al. 2017; Memisevic & Djordjevic, 2018; Şenlik & Atılgan, 2019). As participation in physical education and sports activities affects individuals' physical fitness levels, it may thus help eliminate such deficiencies in children with ID (Mujea, 2014). For this reason, it is important to examine the effects of the practices of the physical education and sports curricula of the schools where these individuals are educated on their physical fitness. Research comparing the physical fitness parameters of special education vocational school students with those of inclusive high schools students is limited (Bossink et al. 2017), with studies on this topic generally concentrating on typically developing students (Sansi & Özer, 2019; Turna et al. 2019; İlhan & Esentürk, 2015; Skowronski et al. 2009; Baynard et al. 2008; Berktas, 2018). Consequently, the present study focused on comparing the physical fitness parameters of students with mild ID enrolled in a special education vocational school versus those inclusive into an inclusive high school.

Regarding the physical fitness levels of the special education vocational school students versus inclusive high school inclusion students included in the study, no statistically significant differences were observed in terms of BMI, 30-m sprint, back strength, or push-ups. Regardless of school type, the physical education and sports classes did not lead to significant differences with respect to these parameters. Since body mass index (BMI) is used as a tool to indicate nutritional status (WHO, 2007), this finding is explained by the fact that the individuals participating in this study live in the same region and likely share similar eating habits. The reason that no significant difference in sprint speed was detected is because that particular characteristic involves a genetic component and can only be improved with the application of close to 100% power (Ben-Zaken et al. 2019). The lack of specialized studies on strength development in physical education practices in schools may explain the similar results between the two groups with respect to back strength and push-ups, as weight training is known to constitute the most efficient and effective method to improve muscle strength (Suchomel et al. 2021; McQuilliam et al. 2020). The fact that practices within the scope of physical education and sports classes fail to take into account specific studies on speed parameters as well may be interpreted as having a significant effect on the development levels of students with regard to these

parameters. In this context, the physical fitness parameter results obtained from physical education and sports practices for individuals with mild ID in different school environments in Turkey also support our research (Berktas, 2018; Ayan et al. 2019, Konar & Şanal, 2020). In contrast, international studies on inclusive and special education vocational school students with ID have reported significant differences in physical fitness parameters (Frey & Chow 2006; Shilpa & Reeta, 2012; Porretta & Winnick, 2016).

The present study found that the inclusive high school students performed the standing long jump better than the special education vocational school students. Szabó et al. (2015) obtained similar results for the standing long jump when comparing the motor skills of individuals with ID, while the findings of Le Cheminant (2019) and Ariffin et al. (2020) were contrary to those of our study. The standing long jump, an anaerobic movement, is known to crystallize as a skill in the age range of 7-10 (Demirci & Demirci, 2014). However, it can be improved to a certain extent by undertaking physical education and athletic activities, and thus functions as an important indicator regarding an individual's level of physical activity (Çayır, 2019). Apropos of this, we may note that inclusive high school students appear to participate more actively in physical education classes and that their peers exert more of an influence on these individuals. Educational programs conducted with typically developing peer groups have been reported to have extremely positive effects on the development of children with ID (Carter et al. 2010).

Concerning flexibility, the present study found that the students attending an inclusive high school again performed better than their non-inclusive counterparts. Flexibility develops based on physical education and sports activities, and thus deteriorates and regresses when physical activity is reduced (Demirci, 2009; Top, 2015). A review of the literature has revealed that studies comparing the flexibility levels of individuals with ID determined that those individuals with mental disabilities who regularly participated in physical activity, physical education, and sports generally possessed greater flexibility. (Akın & Yüksel, 2016; Uçan et al. 2018).

Another parameter examined within the scope of the current study is reaction times. A short reaction time indicates a speedy response on the part of an individual to a stimulus (Giagazoglou et al. 2013). Looking at the reaction times of the students included in this study, we find that the right- and left-hand reaction times of the inclusion students were shorter than those of the special education vocational school students, results that were consistent with those reported in the literature on this topic (Kargar & Talebi, 2021; Yildirim et al. 2010). Reaction time is a critical parameter in the evaluation of reaction skills, which have significant effects on the performance of daily life skills (Rao et al. 2017). We may therefore conclude that the reaction skills of students enrolled in inclusive high schools are superior and that further positive results may obtain given that reaction skills are reflected in daily life skills.

Fernhall & Pitetti's (2000) study on leg strength in individuals with ID compared with their typically developing peers concluded that the latter were stronger. Chaiwanichsiri et al. (2000) obtained similar results in their study comparing the physical fitness of individuals with ID versus those with typical development. In the present study, the leg strength values of the inclusion students were higher than those of the special education vocational school students. However, other studies have reported results contrary to those obtained in our study (Carmeli et al. 2002). Inclusion students aim to adapt to typically developing individuals during the educational process and act in tandem with them as much as possible. Thus, they may show similar development in motor skills to typically developing children, as well as in other developmental areas (Hehir et al. 2016). The greater leg strength exhibited by the inclusion students compared to those in the special education vocational school results from the fact that the former spend more time with typically developing children and hence adapt to them in terms of physical activity.

Turning to hand grip strengths, the values of the inclusion students were higher for both hands than those of the special education vocational school students. In a study conducted by Top (2021) on the motor skill levels of inclusion students versus special education school students, certain motor skills of the former were found to be superior to those of the latter. Hartman et al. (2015) also obtained results that support our findings in their study on the development of physical fitness in children with ID.

Studies have shown that typically developing peers serve as models for inclusion students, affording them opportunities to learn and reinforce what they have learned. Such a situation instills a sense of independence in these students, helping to enrich their world by providing new sources of caution as well as novel behavioral examples (DiSalvo & Oswalt 2002; Leaf et al. 2009). In addition, the participation of individuals with ID in educational activities together with their typically developing peers in a relaxed, natural setting has been found to be more effective and beneficial than methods involving only the researcher/teacher or other arrangements (Fox et al. 1986; Goldstein & Wickstrom, 1986). Hence, we can infer that educating inclusion students in the same environment as their typically developing peers affects their physical fitness parameters.

Conclusions

In conclusion, although no statistically significant differences were observed for certain parameters (push-ups, sprinting speed, and back strength) within the scope of this study, upon thorough examination of all the statistical results obtained, inclusion students with mild ID performed better on all physical fitness parameters than those enrolled in special education vocational schools. This may be due to the fact that students who receive inclusive education at the high school level are integrated into the same environment as students with typical development, with whom they spend more time together, participate in physical education and sports classes together, and thus are more aligned with their typically developing peers in terms of physical fitness (Beilock et al. 2002; Cenikli et al. 2018). A review of the literature revealed several studies suggesting that inclusive education, carried out in accordance with its purpose, contributes positively to the motor skills of individuals with disabilities (Pan, 2008; Top 2021; Kodish et al. 2006; Berktaş, 2018). In line with these results, we believe that it would benefit students with ID to be integrated with their typically developing peers during physical education and sports classes in special education vocational schools. Thus, we recommend that both the education ministry at the national level as well as local governments implement projects to achieve this end.

Conflict of interest

No potential conflict of interest was reported by the author(s).

Ethics Statement

Ethical approval for this study was granted by the directorate of the Scientific Research and Ethics Committee of Muş Alparslan University (document date and number 01.03.2022-42225).

Author Contributions

Study Design, SBS and SD; Data Collection, MM; Statistical Analysis, SD; Data Interpretation, MM and SD; Manuscript Preparation, SBS and SD; Literature Search, SBS, and MM. All authors have read and agreed to the published version of the manuscript.

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International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

Investigation of the Relationship between Physical Activity Level and Quality of Life in Children with Specific Learning Disabilities using Regression Analysis

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Abstract
It has been reported that the academic skills of children with specific learning disabilities (SLDs) and their participation in physical activity may be affected. This study aimed to examine the relationship between physical activity level and quality of life in children with SLDs. The study was conducted with children diagnosed with SLDs at the Afyonkarahisar Special Education and Rehabilitation Center. Once the sociodemographic information of the participants was recorded, their physical activity levels were determined using the Physical Activity Questionnaire for Older Children (PAQ-C, ages 8-14 years), and their quality of life levels were assessed using the Pediatric Quality of Life Inventory (PedsQL). A total of 51 individuals, 21 girls and 30 boys, were included in the study. The mean age of the participants was 10.58±1.51 years. Physical activity score had a weak positive correlation with the physical health summary score (rspearman=0.342, p=0.014); weak positive correlations with the emotional functionality score (rspearman=0.308, p=0.028) and the school functionality score (rspearman=0.337, p=0.016); and moderate positive correlations with the school functionality score (rspearman=0.427, p=0.002), the psychosocial health summary score (rspearman=0.440, p=0.001), and the total PedsQL score (rspearman=0.462, p=0.042). In addition, the physical activity score was determined to statistically significantly predict the total PedsQL score (F=13.297; p=0.001). In conclusion, this study revealed that the physical activity levels of children with SLDs significantly affected their quality of life.

Keywords
Physical activity level, Specific learning disability, Regression analysis, Quality of life

INTRODUCTION

The American Psychiatric Association defines a specific learning disability (SLD) as a neurodevelopmental disorder that hinders the acquisition and utilization of fundamental skills such as reading, writing, and arithmetic (Widiger and Crego, 2018). An SLD is a disability characterized by an individual's academic underachievement despite the absence of any intellectual deficit. Rather than a disease, SLDs are acknowledged as impairments in an individual's normal development of academic skills, speech, learning, and motor skills due to psychological and neurological factors (Peters and Ansari, 2019).

Motor development refers to an individual's ability to acquire controlled functional mobility as a result of the development and growth of their nervous system (Goodway et al., 2019), and it plays an important role in improving the individual's quality of life. To ensure the optimal development of individuals and promote their overall well-being, it is crucial to assess their motor development levels, offer them physical activities that will benefit all areas of development, and encourage them to participate in these activities (Cerit et al., 2020). Individuals with SLDs not only struggle with

Received:20 February 2024 ; **Revised** ; 01 March 2024 ; **Accepted:** 03 May 2024; **Published:** 25 May 2024

How to cite this article: Boya, B., and Saracoglu, I. (2024). Investigation of the Relationship between Physical Activity Level and Quality of Life in Children with Specific Learning Disabilities using Regression Analysis *Int J Disabil Sports Health Sci*;7(3):608-614.https://doi.org/10.33438/ijdshs.1440250

language skills such as speaking, writing, and reading, but they also face challenges related to motor skills, balance, and coordination. Consequently, their ability to participate in activities and engage in physical exercise may decline (Hussein et al., 2020). Children with SLDs who do not participate in sufficient physical activity may experience significant deficiencies in the movement and ability qualities required for normal development. Thus, children diagnosed with SLDs are unable to spontaneously develop the skills and behaviors they need to lead a quality life (Messent et al., 2000; Toptaş Demirci & Dolaş). Therefore, it is recommended that the motor development, motor performance, and physical activities of individuals with SLDs be carefully monitored (Hussein et al., 2020).

Children diagnosed with SLDs exhibit significant impairments in academic skills and motor functions. Previous studies (Cook et al., 2015; Messent et al., 2000) revealed that these children often tended to engage in passive activities and did not prioritize physical activity in their lives. These studies also showed that children with SLDs often needed help from their environment to participate in activities (Grigorenko et al., 2020). In addition, it has been noted that overprotection, a lack of independence training, and limited opportunities are among the reasons that restrict participation in physical activities among these individuals (Greenspan & Love, 2012; Gülgösteren, 2023).

In the literature, studies examining the relationship between physical activity level and quality of life mostly focus on normally developing children (Calzada-Rodríguez et al., 2021; Wafa et al., 2016). Furthermore, there is a lack of research investigating whether the level of physical activity is a determinant of the quality of life in children with SLDs. Primary and secondary school takes up approximately 40% of pupils' waking time and, arguably, an even greater proportion of their opportunities to be physically active (Fox, 2004). It has also claimed that pupils at primary and secondary school diagnosed with SLDs are significantly less likely to meet the recommended physical activity level (Cook and Heinrich, 2015). Therefore, the current study aimed to examine the relationship between physical activity level and quality of life in children with SLDs aged 8 to 14 years.

MATERIALS AND METHODS

This research, designed as a descriptive, prospective, and cross-sectional study, was conducted at the Afyonkarahisar Special Education and Rehabilitation Center between January 2022 and July 2022. This study approved by the Kutahya Health Sciences's NonInterventional Research Ethics Committee with reference number (January 18, 2022, session number 2022/01-12). The participant and their parents gave informed consent along with the volunteer form covering study details, risks, benefits, confidentiality, and participant rights. The study prioritized the rights and welfare of the participant in the design, procedures, and confidentiality measures, strictly adhering to the ethical principles of the Declaration of Helsinki.

Participants

Sixty-seven children aged 8 to 14 years who were diagnosed with SLDs by a child psychiatrist were invited to participate in the study, and those who met the inclusion criteria detailed below were identified the same researcher (B.B.).

Inclusion Criteria

- Diagnosed with an SLD
- Aged 8 to 14 years
- Willing to participate in the study (both the participants and their parents)

Exclusion Criteria

- Acute or chronic orthopedic disease
- Neurological or neuromuscular disease
- Systemic disease
- Vision and hearing problems
- History of any surgical intervention within the last six months
- Being amateur or professional atheletes or doing regular physical activity or sports
- Withdrawal from the study during the evaluations.

Procedure

All participants were evaluated by the same researcher (B.B.) face-to-face, individually, using the data collection tools in the same order. First, the participants' descriptive information was recorded using a sociodemographic and clinical information form. Then, the participants' quality of life was assessed using the Pediatric Quality of Life Inventory (PedsQL). Subsequently, the PAQ-C was administered to determine the physical activity levels of the participants.

Outcome Measurement

PedsQL

The PedsQL is a 23-item scale developed by Varni et al (Varni et al., 1999) that can be used in all children aged two to 18 who are healthy and do not have any disease. The items on the PedsQL are scored from 0 to 100. If the answer to a question is "never", it is scored as 100 points, "almost never" as 75, "sometimes" as 50, "often" as 25, and "almost always" as 0. A high total score from PedsQL indicates a high level of health-related quality of life (Varni et al., 2001). The scale consists of four domains examining emotional, social, physical, and school functioning. The validity and reliability study of the Turkish version of the PedsQL (PedsQL-TR) was conducted with children aged two to 18 years (Memik et al., 2007), and the internal consistency coefficient of the PedsQL-TR was reported to be 0.86. Three scores are obtained from the scale: the physical health summary score (sum of the scores of the items in the physical functioning scale), the psychosocial health summary score (sum of the scores of the items included in the emotional, social, and school functioning scales), and the total score (sum of the scores of all items in the scale) (Memik et al., 2007).

PAQ-C

The children's physical activity levels were determined using the PAQ-C (ages 8-14 years), which was developed by Crocker et al. in 1997 (Crocker et al., 1997) and adapted to Turkish (PAQ-C-TR) by Erdim et al. (Erdim et al., 2019). In the internal consistency analysis of the PAQ-C-TR, the total score correlations were examined and found to be at an appropriate reliability level. The Cronbach alpha coefficient was reported to be 0.77 (Erdim et al., 2019). The PAQ-C-TR assesses individuals' general physical activity levels based on their recollection of activities performed within the past week. It can be easily administered in classroom settings and provides information about individuals' general physical activity levels. In PAQ-C-TR, 1 point indicates the lowest physical activity level, and 5 points indicate the highest physical activity level. When calculating the physical activity scores of the participants, the average of all the questions is determined (Erdim et al., 2019).

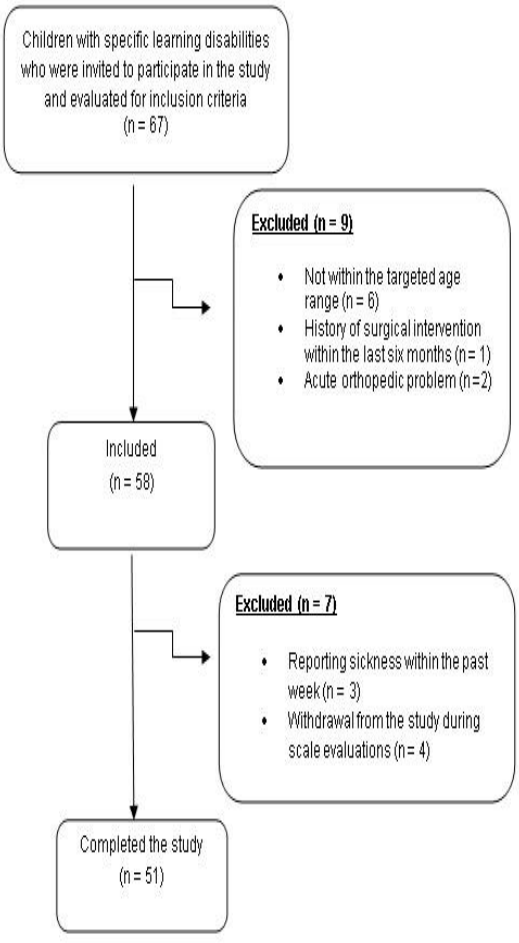

Figure 1. Flow Chart of the Study

Statistical Analysis

The analysis of all data was performed using the IBM SPSS Statistics v. 17 (SPSS Inc., Chicago, IL) package program. Whether the distribution of the data was normal was examined according to the skewness and kurtosis coefficient values. Accordingly, it was observed that the skewness and kurtosis coefficients of the physical activity score, the physical health total score of quality of life, the emotional functioning score, the social functioning score, the school functioning score, the psychosocial health summary score, and the total scale scores were in the range of +2, to -2; therefore, the data was considered to have a normal distribution. The quantitative demographic data of the participants were shown as mean ± standard deviation and minimum-maximum values. Categorical data were reported as numbers and percentages.

Whether there was a relationship between the physical activity score and the quality of life subscores was examined with the Spearman

correlation analysis since the data showed a normal distribution. Correlation coefficients were used to examine the relationship between these two variables. Accordingly, the correlation was interpreted to be "very strong" if the correlation coefficient value was 0.90 or above, "strong" if 0.70-0.89, "moderate" if 0.40-0.69, "weak" if 0.10-0.39, and "very weak" if 0.10 or below (Schober et al., 2018).

After the correlational analyses of the variables included in the research, they were also examined with simple linear regression analysis for the independent variable (the total quality of life score) and the dependent variable (the physical activity score). Prior to the regression analysis, it was also determined that the data met the necessary assumptions for this analysis.

RESULTS

Initially, 67 primary school children were invited to participate in the study, but 9 children who did not meet the inclusion criteria and seven children were excluded (Fig. 1). As a result, the study was completed with 51 participants, including 21 girls (41.2%) and 30 boys (58.8%). The mean age of the participants was 10.58 ± 1.51 years. The participants' demographic data, namely gender, age, weight, height, body mass index, and educational level, and their quality of life and physical activity scores are shown in Table 1. In the evaluation of the PedsQL-TR domains, the lowest score was obtained from school functioning and the highest score from social functioning.

Table 1. Descriptive data of the participants

Continuous Variables	Mean ± SD	Min-Max
Age (year)	9.80 ± 1.19	7-14
Height (cm)	139.83 ± 11.32	106.0- 164.0
Weight (kg)	34.80 ± 12.84	24.0-53.0
BMI (kg/m²)	17.37 ± 4.12	12.80-27.80
PAQ-C-TR (0-4 points)	3.28 ± 0.51	
PedsQL-TR physical health	82.73 ± 11.95	53.12-100.00
PedsQL-TR emotional health	78.92 ± 13.27	55.00-100.00
PedsQL-TR social functioning	86.17 ± 13.21	50.00-100.00
PedsQL-TR school functioning	64.80 ± 16.55	25.00-100.00
PedsQL-TR psychosocial health	76.72 ± 11.54	50.00-100.00
PedsQL-TR total score	78.12 ± 10.49	56.40-98.43
Categorical Variables	**Frequency (percentage)**	
Gender		
Male	30 (58.8)	
Female	21 (41.2)	
Educational level		
Primary school	30 (58.9)	
Secondary school	21 (41.1)	

PedsQL-TR: Turkish version of the Pediatric Quality of Life Inventory, PAQ-C-TR: Turkish version of the Physical Activity Questionnaire for Older Children Aged 8-14 Years, ± SD: mean ± standard deviation, min-max: minimum-maximum, cm: centimeter, kg: kilogram, BMI: body mass index, m^2: square meter

The PAQ-C-TR was found to have weak positive correlations with the PedsQL-TR physical health summary score ($r_{spearman}$ = 0.342, p = 0.014), emotional functioning score ($r_{spearman}$ = 0.308, p = 0.028), and school functioning score ($r_{spearman}$ = 0.337, p = 0.016) and moderate positive correlations with the PedsQL-TR social functioning score ($r_{spearman}$ = 0.427, p = 0.002), psychosocial health summary score ($r_{spearman}$=0,440, p=0,001), and total score ($r_{spearman}$ = 0.462, p = 0.042) (Table 2).

Table 2. Correlations between the physical activity score and the quality of life scores

		PedsQL-TR physical health	*PedsQL-TR emotional functioning*	*PedsQL-TR social functioning*	*PedsQL-TR school functioning*	*PedsQL-TR psychosocial health*	*PedsQL-TR total*
PAQ-C-TR score	r	0,342*	0,308*	0,427*	0,337*	0,440*	0,462*
	p	0,014	0,028	0,002	0,016	0,001	0,001
	n	51	51	51	51	51	51

PedsQL-TR: Turkish version of the Pediatric Quality of Life Inventory, PAQ-C-TR: Turkish version of the Physical Activity Questionnaire for Older Children Aged 8-14 Years, r: correlation coefficient, p: significance value, n = number of participants, *p < 0.05

It was also determined that the PAQ-C-TR score statistically significantly predicted the PedsQL-TR total score (F = 13.297; p = 0.001). The participants' physical activity scores explained 19.7% of the variance in the quality of life scale total score (R square = 0.197). A one-unit increase in the physical activity score resulted in an increase of 9.449 units in the total scale score (95% confidence interval: 4.242-14.656) (Table 3).

Table 3. Effect of the physical activity score on the total quality of life score

Independent variable	Unstandardized constants		Standardized constant	t	p	95% CI
	B	SE	β			
(Constant)	47.128	8.602		5.479	<0.001	29.842-64.414
PAQ-C-TR score	9.449	2.591	0.462	3.647	0.001	4.242-14.656
Dependent variable: PedsQL-TR total score						
Durbin-Watson: 2.124	F = 13.297; p = 0.001		R = 0.462	R^2 = 0.213	Adj R^2 = 0.197	

PedsQL-TR: Turkish version of the Pediatric Quality of Life Inventory, PAQ-C-TR: Turkish version of the Physical Activity Questionnaire for Older Children Aged 8-14 Years, F: significance of the model, B: coefficient of the variable, SE: standard error, β: standardized constant, t: test value, p: significance value, CI: confidence interval, Adj R^2 = proportion of the variance in the dependent variable explained by independent variables

DISCUSSION

This study, which aimed to examine the relationship between the physical activity level and quality of life of children diagnosed with SLDs, was completed with the participation of a total of 51 children, of whom 21 were girls and 30 were boys. According to the results, the physical activity score was moderately positively correlated with the quality of life social functioning, psychosocial health summary, and total scale scores and weakly positively correlated with the physical health summary, emotional functioning, and school functioning scores. Furthermore, it was observed that the physical activity score significantly predicted the total quality of life score. In conclusion, this study demonstrated a potential improvement in the quality of life of children diagnosed with SLDs with an increase in their levels of physical activity.

In the literature, there are many studies investigating the relationship between physical activity levels and quality of life in healthy or normally developing populations, and they have consistently proven the presence of a positive linear relationship between these two variables (Bize et al., 2007; Calzada-Rodríguez et al., 2021; Ergül et al., 2018; Wafa et al., 2016). Similarly, studies on children with attention deficit disorder (Ganjeh et al., 2021; Mohammadi et al., 2022) concluded that there was a significant relationship between physical activity level and quality of life and that physical activity had a significant effect on emotion/mood (Cornelius et al., 2017). Furthermore, a meta-analysis covering 109 studies reported that physical activity had positive effects on physical health and psychosocial health in children with intellectual disabilities (Kapsal et al., 2019). In the current study, significant relationships were found between the physical activity level of individuals with SLDs and the physical health score among the quality of life parameters. It was also observed that the physical activity score statistically significantly predicted the quality of life physical

health summary score. Accordingly, it was predicted that a one-unit increase in the physical activity score would result in an approximately eight-unit increase in the quality of life physical health summary score. Our study examined the relationship between the physical activity level and quality of life of individuals with SLDs through regression analysis, a method that is considered to make a significant contribution to the results of this examination.

It is known that being physically active offers many benefits, including preventing chronic diseases and early deaths, improving physical and mental health, and increasing the quality of life (Lahart et al., 2019). Quality of life is a broad, multidimensional concept that encompasses social, mental, and physical functions. Enhancing children's quality of life is crucial for their current and future well-being; therefore, it is considered a priority area for health interventions (Basterfield et al., 2021). The current study is valuable for examining the relationship between physical activity levels and quality of life in children with SLDs, who may experience significant impairments in mental and motor functions, and for demonstrating a significant relationship. The data collected from primary school-age children contributes to the literature on the challenges encountered by children while transitioning to primary school and may also provide guidance in implementing preventive measures for a more physically active lifestyle at an older age.

There are certain limitations to this study. First, the subtypes of SLDs were not evaluated, and a homogeneous participant group was not achieved. Second, voluntary participation in the study may have introduced potential selection bias due to individuals' willingness to take part. Third, the use of convenience sampling may have led to under- or over-representation of certain groups in the sample. Fourth, Since it is possible to reach a limited number of children with SLDs, the priori sample size could not perform for this study. Lastly, another important limitation is that physical activity levels were determined subjectively using a self-reported scale without being supported by an objective method, such as the use of a pedometer or accelerometer.

Conclusion

The results of this study revealed that the physical activity levels of children with SLDs significantly affected their quality of life. The quality of life scores of children diagnosed with SLDs can be significantly improved through interventions by parents and physical education teachers, along with occupational therapists and physiotherapists working in this field, in order to increase their physical activity levels and activity participation.

Acknowledgement

This study was presented as an oral presentatiton at 1st Internatıonal Congress of Selçuk Health Sciences Congress, 01-02 December 2022, Konya, TÜRKİYE.

Conflict of Interest

No conflict of interest is declared by the authors. In addition, no financial support was received.

Ethics Committee

The study protocol was approved by the Kütahya Sağlık Bilimleri Üniversitesi Rektörlüğü Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu (Karar No: 2021/21 Tarih: 20.09.2021)

Author Contributions

Study conseption and design: BB and IS; Data Collection: BB; Data analysis and interpretation: IS; Draft manuscript preparation: BB and IS; Literature Search: BB. All authors have read and agreed to the
published version of the manuscript.

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International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

Comparison of Some Physical Characteristics of Young Judoka and Wrestlers

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Abstract
Purpose: This research sought to assess and contrast the physical attributes of adolescent wrestlers and judo practitioners aged 13 to 16, aiming to identify key physical and motor skills that contribute to performance excellence in these sports. Method: A total of 30 athletes were randomly assigned to the wrestling (n=15) and judo (n=15) groups. These athletes train 4 to 6 days a week. In this study, body composition, horizontal jump test, hand grip strength, flamingo balance test, sit and reach test and shuttle run of combat athletes were evaluated. Statistical analysis was conducted utilizing the SPSS 20.0 program. Findings: Based on the results, the average age of the participants was calculated to be (13.7±1.2) for judo and (14.8±1.7) for wrestling, with their respective sports ages being (5.3±1.3) for judo and (5.6±1.2) for wrestling, and their heights being (161.1±10.7) for judo and (169.4±9.4) for wrestling. Although a significant difference was noted in the lean body mass percentage, the results of the horizontal jump, hand grip strength tests, sit and reach test, flamingo balance test and shuttle run showed no significant variance. Conclusion: The lack of a significant difference in the outcomes observed between judo participants and wrestlers in this age category can be attributed to the similarity of these sports disciplines. The follow-up of the process will provide detailed information about the physical characteristics and performances of combative athletes and will provide scientific contribution to the training and development processes of athletes in this age group.

Keywords
Wrestling, Judo, Horizontal Jump, Combat Sports, Hand Grip

INTRODUCTION

Contemporary research in sport sciences shows a great interest in understanding the physical development of young athletes and the effects of this development on sport performance. In this context, sports requiring intense physical competition such as wrestling and judo offer an excellent field for the evaluation of physical and athletic abilities of young combat athletes (Çakıroğlu et al., 2012). Male athletes in particular go through a rapid period of growth and development between the ages of 13 and 16, and assessing physical characteristics during this time is crucial to understanding their future performance potential. Judo is a sport branch that incorporates concepts such as balance, strength, endurance, flexibility, speed, quickness, coordination (Yüksek et al., 2004), and in terms of its technical characteristics, it is a level defense art that best overcomes the opponent with the methods of not resisting the opponent's force and even taking advantage of the opponent's force. Wrestling, on the other hand, is a historical combat sport practiced worldwide and at the Olympic level (Cicioğlu et al., 2007) and the most important physical characteristics required to achieve successful results in wrestling competitions are; Having good anaerobic and aerobic capacity, upper and lower body strength, power, agility and flexibility (Bloomfeld et al., 1994).

Received: 22 February 2024 ; **Revised** ; 25 March 2024 ; **Accepted:** 03 May 2024; **Published:** 25 May 2024

How to cite this article: Çağlar, E.Ç., Kutlu, M., and Taşkıran, C. (2024). Comparison of Some Physical Characteristics of Young Judoka and Wrestlers. *Int J Disabil Sports Health Sci*;7(3):615-620.https://doi.org/10.33438/ijdshs.1441502

Wrestling and judo are sports that require different technical and tactical skills, but both require combat and high levels of physical strength, agility and endurance. These sports promote the development of motor skills, physical strength and psychological resilience of young athletes. However, Wrestling and Judo sports are defined as the struggle of two opponents to establish superiority over each other through technical tactical practices, requiring similar physical physiological characteristics (Jäggi et al., 2015).

Claw strength is a vital factor in wrestling in terms of controlling the opponent and in judo in terms of providing an effective grip due to clothing. The long jump stands out as an indicator of general athletic ability, explosive power and lower body strength (Aydos et al., 2004).

Within the realm of sports science research, there exists a scant volume of investigations exploring the varied impacts and demands associated with these two martial arts disciplines (Aydos et al., 2004; Çakıroğlu et al., 2013; Franchini et al., 2011; , Fry et al., 2006; Lakicevic et al., 2020; McDonald et al., 2019). This deficiency suggests that comprehensive information is needed to design more effective education and training programs for young athletes.

This study aimed to evaluate the physical and certain motor characteristics of wrestling and judo athletes aged (13 – 16), to identify factors influencing success in these sports, and to aid in the development of more efficient training programs for young athletes.

MATERIALS AND METHODS

Research Group

A total of 30 male athletes aged 13-16 years from licensed sports clubs in the province of Çorum who voluntarily practiced wrestling (n=15) and judo (n=15) took part in the study. Every athlete involved in the study was chosen from those who compete and train between 4 to 6 days per week. This study complies with ethical standards and was approved by Hitit University Non-Interventional Ethics Committee with reference number (2024-0018). The participant provided informed consent with a consent form covering study details, risks, benefits, confidentiality and participant rights. The study strictly adhered to the ethical principles of the Declaration of Helsinki and prioritized the rights and welfare of the participant in the design, procedures and confidentiality measures.

Working Procedure

The body composition of the participants was analyzed before the study. After filling out a demographic information form for each participant, horizontal jump test, hand grip strength, flamingo balance test, sit and reach test, and shuttle run measurements were performed.

Data Collection Tools

Weight: body weight, length: height, body composition analysis; body mass index, fat mass and lean body mass, horizontal jump test, hand grip strength, flamingo balance test, sit and reach test, and shuttle run were measured.

Body Composition Analysis

Data on the body composition of the participants were obtained with the Tanita 418 BC instrument using bioelectrical impedance as the method.

Horizontal Jump Test

The starting point is determined on a flat ground with a strip of adhesive tape. The subjects are asked to jump as far as possible with their toes on the starting line, arms at the side and simultaneously swinging back and forth. The jump distance is measured from the starting line to the back point where the heels touch the ground. In this way, the test is repeated twice and the best value is recorded in cm (Maulder & Cronin 2005).

Hand Grip Strength Test

Hand grip strength (hand claw) was measured using a Takei digital hand dynamometer. The subject stood upright and the dynamometer was adjusted to the size of the subject's hand. The subject's arm was extended and started with the right hand. The maximum grip force was measured from the side at an angle of 10-15 degrees to the shoulder. The subject had to perform 2 repetitions with both hands and the best result was recorded in kg (Günay et al., 2013).

Flamingo Balance Test

Flamingo balance test can be used to determine the static balance abilities of athletes. The balance material used for the test is a wooden beam with a length of 50 cm, a height of 5 cm and a width of 3 cm. The athlete steps on the balance material with the selected foot and receives support from the test administrator in order to maintain his/her balance and take the correct position before the test. The athlete then bends his/her free foot from the knee towards the back and holds it with the

hand in the same direction. When the athlete is ready, he releases the assistant's hand and the stopwatch is started at the same time. The stopwatch is stopped every time the athlete loses balance and is started again when the athlete is ready 60 sec. The total number of balance losses during the period is recorded.

Sit and Reach (flexibility)

The Sit and Reach Test is measured using a tripod. The subjectis seated on the floor and the bare foot rests flat on the test table, the torso (waist and hips) is bent forward and the knees are asked to reach as far forward as possible without bending the knees, with the hands in front of the body. The subject triedto reach the farthest point in this way, and at the last point, he/she was kept waiting for 2 seconds and the value was recorded. The tester stands next to the subject and prevents the subject's knees from bending, the test is repeated twice and the higher value is recorded (Miller, 2006).

Shuttle Run(agility)

A 4X9m shuttle run was performed to measure the agility of the athletes. In the shuttle run, the athletes started from behind the line and were observed to step on the line at the end of every 9m. The results were recorded in seconds and split-seconds.

Statistical analysis

The data were statistically analyzed using SPSS 20.0 (Statistical Package for the Social Sciences, Version 22.0, SPSS Inc., Chicago, IL, USA). The choice between parametric and non-parametric tests was based on the evaluation of the normal distribution using the Shapiro-Wilk test. Depending on the distribution of the data, the numerical variables were expressed either as mean ± standard deviation or as median (range from minimum to maximum). For data conforming to a normal distribution, the independent samples test was used to analyze numerical comparisons between two different groups, while the Mann-Whitney U test was used for data not conforming to a normal distribution. The significance level was set at $p < 0.05$ for all tests.

RESULTS

Table 1. Physical traits of the athletes taking part in the study.

	Group Wrestling (n:15)	Judo (n:15)	t	p
	X±Sd Min – Max	X±Sd Min – Max		
Age	14,66±1,17 (13 – 16)	13,73±1,22 (13-15)	2,19	**0.037**[a *]
Sports Age	5,60±1,23 (4-8)	5,33±1,23 (4-7)	0.664	0.539 [a]
Height	169,40±9,40 (148-184)	161,13±10,70 (141-178)	-2.247	**0.033**[b*]
Body Weight	64,24±17,80 (33-108)	53,13±14,78 (28-79)	-1.859	0.074[b]
Bmı	22,08±4,89 (15-35)	20,07±3,51 (14-25)	0.913	0.367[a]
Fat percentage	14,90±4,57 (9-27)	16,87±5,37 (10-28)	-1.203	0.233[a]
Ffm	54,06±12,38 (29-78)	43,80±11,28 (25-62)	-2.371	**0.025**[b*]

X : Average; Sd: Standard deviation a: Mann-Whitney U Test; b: Independent Samples Test

Judo (13.7±1.2), wrestling (14.8±1.7), sports age (wrestling: 5.6±1.2), (judo: 5.3±1.3) age of the participants in the study height wrestling 169.4±9.4 (148 – 184), judo (161.1±10.7) (141-178), average body weight wrestling 64.2±17.8 (33-108), judo (53.1±14.7) BMI wrestling (22.08±4), judo (16.8±5.3), fat percentages wrestling (14.9±4.5), judo (16.8± 5.3), Fat free mass (ffm) wrestling, (54.0±12.3), judo (43.8±11.2) (Table 1).

Table 2. Data regarding the horizontal jump and hand grip motor characteristics of the athletes are presented in (Table 2)

Parameter	Group	X±Sd	t	p
Horizontal Jump (m)	Wrestling Judo	2.33±0.29 2.23±0.31	- 0,842	0,407[a]
Hand Grip Left	Wrestling Judo	34.53±8.88 29.26±9.63	- 1,556	0,131[a]
Hand Grip Right	Wrestling Judo	34.73±8.18 31.53±10.65	0.748	0.461[b]
Flamingo balance test(n)	Wrestling Judo	9.66±4.09 10.20±4.34	-0.188	0.870[b]
Sit and reach (cm) (flexibility	Wrestling Judo	24.26±7.15 25.66±6.30	-0.645	0.539[b]
Shutte run(s)(agility)	Wrestling Judo	10.76±1.30 9.74±0.74	2.573	**0.009[b]**

X : Average; Sd: Standard deviation a: Mann-Whitney U Test; b: Independent Samples Test

The research indicated that there was no substantial disparity observed in horizontal jumping, right-hand grip strength, left-hand grip strength, flamingo balance test, sit and reach test and shuttle run between both groups. (p> 0.050).

DISCUSSION

In both wrestling and juda, which are combat sports, one of the main problems encountered by coaches and athletes is what physical characteristics will lead to success. For this reason, our study aimed to determine some important physical characteristics of male wrestling and judo athletes between the ages of 13-16 and compare them. Firstly, significant differences were found between wrestling and judo athletes in terms of age, height and lean body mass. In judo sport, both in training and in championships, athletes frequently and intensively apply movements such as pulling, pushing and throwing by grasping the judo suit of their opponents. During such movements, the forearm flexor muscles in the forearm, which have a great effect on grip strength, are actively used. Therefore, although statistically significant results were expected in the hand grip strength parameters of athletes who only practiced judo compared to wrestling, no significant difference was observed in the right and left hand grip strength values compared to wrestling. These findings may reflect the effect of different physical demands of sports branches and training methods on athletes' body composition. For example, judo athletes generally have a higher lean body mass, which may be attributed to the strength and explosive power demanding characteristics of this sport (Franchini et al., 2011). Results revealed significant variations in age, height, and lean body mass among athletes participating in wrestling and judo.These findings are consistent with the outcomes of prior research.example, a study by Fry et al. revealed that the anthropometric profiles of athletes in different martial arts differed significantly (Fry et al., 2006). (8)The effect of anthropometric differences such as age, height and lean body mass on sport performance has been widely studied in the sport science literature. It has been shown that these differences can be determinants for success in specific sports, especially in young athletes (Lakicevic et al., 2020). It has been observed that wrestlers are generally shorter and more compact, while judoka are taller and have a lean body mass (McDonald et al., 2019). In terms of hand grip strength and long jump performance, our study showed that there was no significant difference between the two sports. This finding may indicate that both sports require similar levels of strength and agility. In the literature, it has been reported that hand grip strength is a good indicator of overall strength level (Wind et al., 2010). Similarly, long jump performance is an important measure of agility and explosive power (Özdemir, 2009). Tural et al., (2021) examined the effects of 8-week core exercises on maximal strength, (leg, back and grip strength) vertical jump and flexibility in freestyle competitive wrestlers aged 15-17 years, and at the

end of the study, no significant difference was found in body weight, right and left grip and core strength before and after core strength training (p>0.05). It is in parallel with our study. Tortum (2018), in his study investigating the effects of eight-week judo training on strength, flexibility and balance performances of 12-13 year-old children, explained that judo training applied to athletes provided a significant increase in the hand grip strength of individuals. Aydos et al., (2004) In their study with the participation of 77 male athletes in basketball, volleyball, boxing, wrestling, judo and weightlifting, it was stated that individual athletes had higher leg strength and back-lumbar strength than team athletes, and right and left hand grip strengths were similar. Saygın et al., (2017) compared the aerobic capacity values of 14-15 years old Greco-Roman style wrestlers according to weight classes and found significant differences in vertical jump, anaerobic power, and hand grip strength. Çakıroğlu et al., (2014) examined the effects of judo and game training on the physical development of children in 8-10 years old boys and observed a significant increase in body weight, height, vertical jump, standing long jump, claw strength (right hand-left hand), sit-ups and flexibility values. The fact that the wrestlers were significantly one year older and taller is thought to be effective in the results (P<0.05). (Gencay et al., 2018) in their study 54 adolescent wrestlers and judoists were evaluated using static and dynamic balance, flamingo balance test and when static balance performance scores were compared between groups, it was determined that judoists had higher static balance performance than wrestlers (P<0.05). In a similar study; 51 boys aged 14-15 years, 26 of whom had been practicing judo for at least 2 years and 25 of whom did not practice any sport ('inactive') participated in the study. In the study, static balance was measured with a modified version of the Flamingo Test. As a result of the study; it was observed that boys who practiced judo had a higher level of dynamic balance than those who did not (Witkowski et al., 2014). In another study conducted on the Shuttle Run Test; In a study conducted by (Raj, 2016) on 30 boxers, 30 wrestlers and 30 judo players aged between 18 and 23, a significant difference was observed in the results of the shuttle run test, is in line with our research. (Demirkan, 2015) No significant difference was found in the physical and physiological flexibility parameters of one hundred and twenty-six wrestlers aged 15-17 years. Therefore is in line with our study. In a similar study; In the research conducted on 12 male wrestlers and 12 male judoists between the ages of 9-21, no significant difference was observed in the 20 m Shuttle Run Tests (Koyunlu et al., 2020). It is not in line with this research. In addition, it is thought that the fact that the sports age is similar, both sports are combat sports and include similar physical physiological requirements may be effective in not creating significant differences. In conclusion, this study illuminated the physical differences and similarities between wrestling and judo athletes.

These findings provide information for coaches and sport science professionals to better understand the training programs and specific needs of young athletes. Additionally, this research indicates the necessity for more in-depth investigations to fully comprehend the physical progression and performance capabilities of young athletes.

ACKNOWLEDMENT

I would like to express my sincere gratitude to our esteemed coaches working at Çorum Mahmut Atalay Judo Hall and our devoted athletes who supported us in this process, for their contributions to the realization of this study. During our research, their patience, understanding and cooperation during the measurement phase was one of the important factors that increased the quality of our study. The professionalism, dedication and desire of each of them to contribute to sports science played a critical role in the success of this research. On this occasion, I would like to thank them again for their valuable contributions to our scientific research.

Conflict of interest

The authors declare no conflict of interest.

Ethics Statement

The non- interventional study was approved by the Hitit University Non-Interventional Ethics Committee numbered (2024-0018) were obtained.

Author Contributions

Study Design, EÇÇ, MK and CT; Data Collection, EÇÇ; Statistical Analysis, MK; Data Interpretation, CT and EÇÇ; Article Preparation, CT and MK; Literature Search, EÇÇ, MK and CT. All authors read and accepted the published version of the manuscript.

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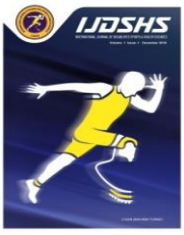

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

RESEARCH ARTICLE

Position-Specific Movement Characteristics and Heart Rate Profile of Hearing-Impaired Futsal Players: A Simulated Game Analysis

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Abstract
The aim of this study is to compare the movement characteristics and heart rate (HR) response of hearing-impaired futsal players based on their playing positions during a simulated game. The study involved twelve players from the Turkish Deaf Men's Futsal National Team, and *PlayerLoad (PL)* metrics such as total PL (PL_{TOTAL}), PL per minute ($PL \cdot min^{-1}$), peak PL (PL_{PEAK}), low to very high PL bands (PL_{LOW}-PLV_{HIGH}), and *external load* variables such as acceleration (ACC), deceleration (DEC), explosive efforts (EXP_{EFF}), and right/left change of direction (COD-R, COD-L), were analyzed using inertial movement analysis (IMA). Additionally, the internal load metrics, including minimum, average, and maximum HR (HR_{MIN}, HR_{AVE}, HR_{MAX}), percentage of HR_{MAX} ($\%HR_{MAX}$) and percentage of time spent in different HR zones (HR_{ZONE1} to HR_{ZONE4}) were continuously monitored. IMA variables and HR metrics, based on playing position, were analysed with the Kruskal-Wallis H test. Group comparisons were conducted using the Mann-Whitney U test, and Bonferroni correction was applied. As a result, PL variables change with notable distinctions between defenders and wingers. Additionally, the PL_{VHIGH} stands out as the only significant difference when comparing wingers and pivots. Wingers generally exhibit different external load, including ACC and COD-L, compared to defenders. Additionally, differences were observed in COD-L between pivots and defenders, as well as in COD-R between pivots and wingers. In conclusion, external and internal load metrics during the simulated game vary depending on the players' positions in hearing-impaired futsal players, highlighting the importance for coaches to consider this diversity in their athlete monitoring approaches.

Keywords
External Load, Internal Load, Inertial Movement Unit, Indoor Soccer, Deaf Athletes

INTRODUCTION

The number of people with hearing impairments worldwide is predicted to reach 900 million by 2025; over 90 million of these individuals will reside in Europe (Peracino, 2015). There are over 2,070 sports and social clubs with their own websites that connect deaf individuals throughout the world (Szulc et al., 2017). The training of athletes in disabled sports is becoming increasingly urgent in connection with the development of this branch of sport. However, the training process in deaf sports, especially in team sports, cannot be equated with the training of healthy athletes (Sobko, 2013). Therefore, various physical and physiological factors can affect the performance of hearing impaired players during training and matches. Previous research show that individuals with hearing impairment have lower physical capacity and motor skill performance when compare with hearing athletes (Cobanoglu et al., 2021; Dummer et al., 1996; Favretto et al., 2019). However these studies has primarily focused on hearing-impaired athletes in team sports like soccer (Yapici et al., 2023), handball (Serdar & Nebahat, 2020; Vujkov et al., 2010), basketball (Sobko, 2013), and volleyball (Kazakov et al., 2023), rather than the specific demands of Futsal.

Received: 23 February 2024 ; **Revised** ; 25 March 2024 ; **Accepted:** 03 May 2024; **Published:** 25 May 2024

How to cite this article: Alvurdu, S., Keskin, K., and Arslan, Y. (2024). Position-Specific Movement Characteristics and Heart Rate Profile of Hearing-Impaired Futsal Players: A Simulated Game Analysis. *Int J Disabil Sports Health Sci*;7(3):621-629.https://doi.org/10.33438/ijdshs.1441768

The activity profile of players in futsal serves as a pivotal aspect influencing game strategies, training regimens, and player performance. Through the integration of various technological approaches, researchers have been able to gain profound insights into the intricate dynamics of futsal matches. Time and motion analysis techniques have elucidated the diverse physical demands placed on players, highlighting the frequency and intensity of movements such as sprinting, changes of direction, and acceleration (Barbero-Alvarez et al., 2008; De Oliveira Bueno et al., 2014). Moreover, physiological parameter monitoring, encompassing metrics like heart rate (HR) and oxygen consumption, provides valuable data on the metabolic demands and physiological responses of players throughout the game (Castagna et al., 2009; Makaje et al., 2012; Milioni et al., 2016). Furthermore, the utilization of cutting-edge tracking technologies such as GPS and accelerometers (inertial movement units) enables detailed assessments of players' spatial distribution, movement patterns, and velocity profiles during match play (Ribeiro et al., 2020; Yiannaki et al., 2020). By utilizing these technological advances, researchers are better able to decipher the nuanced activity profile of futsal players. According to our knowledge, there is not any study on hearing-impaired players have focused on acute mechanical and physiological responses during the training or game in any team sports. In line with this, the hypothesis of this study was to determine the movement characteristics of hearing-impaired players during the futsal game who are subject to typical futsal rules (Beato et al., 2014), except for the usage of flags only to signify violations and all other events during the match. Therefore, the present study aims to investigate the movement characteristics and HR responses of hearing-impaired futsal players and to compare the external and internal load metrics based on their playing positions during a simulated game.

MATERIALS AND METHODS

Participants

A priori analysis was conducted on G*Power (version 3.1.9., University of Kiel, Germany) which provided an estimated sample of 12 with a power (1-β) of 80% and an α error of 5,0% with an effect size 0.8 for pair comparisons. The inclusion criteria for the participants during the preparation period for the international futsal tournament were as follows: (1) training duration 5 times a week with an average duration of 80 minutes, (2) not having suffered a lower limb injury in the last 6 months, (3) no intensive training 48 hours prior to the simulated game. A total of 12 male futsal players (age: 21.5 ± 2.8 years; height: 177.9 ± 4.9 cm; and body weight: 72.2 ± 4.8 kg) from Turkish Deaf Men's Futsal National Team voluntarily participated in the study. The positions of the players were categorized into defenders (n=3), wingers (n=6) and pivots (n=3) (Caetano et al., 2015). Goalkeepers were not included in the study. The participants avoided smoking, strenuous exercise, and consuming alcohol, energy and/or caffeinated beverages for the 24 hours before the simulated game. All participants completed a written informed consent form after receiving a full description of research, risks, benefits, confidentiality, and participant rights. This study was approved by Gazi University Ethical Commission with the reference number of 2024-109 and conducted in accordance with the ethical principles of Declaration of Helsinki.

Data Collection

The activity profile of players during the game were monitored using Catapult Optimeye S5 (CatapultSports, Melbourne, Australia) with IMU technology, comprising a tri-axial accelerometer, gyroscope, and magnetometer, which provide data for inertial movement analysis (IMA) at a sampling rate of 100 Hz. The validity of the IMU systems has been demonstrated by the previous studies for running-based team sport (Alanen et al., 2021; Armitage et al., 2021; Luteberget et al., 2018; Nicolella et al., 2018; Roell et al., 2018), and the IMA to measure external load metrics of the players during the training and games has been used widely by various indoor sports, such as handball (Luteberget & Spencer, 2017; Wik et al., 2017), basketball (Espasa-Labrador et al., 2023; Ransdell et al., 2020) and futsal (Spyrou et al., 2021; Yiannaki et al., 2020).

Variables of movement characteristics obtained with IMA were included *PlayerLoad (PL)* metrics such as total PL (PL_{TOTAL}), PL per minute ($PL \cdot min^{-1}$), peak PL (PL_{PEAK}), low to very high PL bands (PL_{LOW} to PL_{VHIGH}), and *external load* variables such as acceleration (ACC), deceleration (DEC), explosive efforts (EXP_{EFF}), and right/left change of direction (COD-R, COD-L).

PL is an abbreviation for the cumulative sum of accelerations along all three axes recorded by a

triple-axis accelerometer throughout motion (at a frequency of 100 Hz), presented as an arbitrary unit (a.u). To obtain an intensity index, PL is divided by time, resulting in PL per minute ($PL \cdot min^{-1}$), and PL bands are classified into four categories: PL_{LOW} (1-2 g); PL_{MED} (2-3 g); PL_{HIGH} (3-4 g); PL_{VHIGH} (> 4g) (Ward et al., 2018).

ACC_{LOW}, ACC_{MED}, and ACC_{HIGH} represent the overall inertial movements captured under a positive forward acceleration vector within the elevated range (from 1-2 $m \cdot s^2$, 2-3 $m \cdot s^2$, greater than 3 $m \cdot s^2$), while DEC indicates those detected under a negative deceleration vector within the same threshold (Akenhead et al., 2013). COD defines the total inertial movements observed in a sideways left-right vector above the specified limit. EXP_{EFF} includes all inertial movements regardless of direction (including ACC, DEC, and COD, excluding jumps) within intermediate and higher thresholds (greater than 2.5 $m \cdot s^2$) (Casamichana & Castellano, 2015; Spyrou et al., 2021).

HR was monitored continuously at 1-sec. intervals using a chest strap sensor (Polar T31 coded transmitter, Polar Electro Oy, Finland) and minimum, average and maximum HR (HR_{MIN}, HR_{AVE}, HR_{MAX}), percentage of HR_{MAX} ($\%HR_{MAX}$) and percentage of time spent in different HR zones (HR_{ZONE1} to HR_{ZONE4}) were calculated where Zone 1 = 50-60% HR_{MAX}, Zone 2 = 60-70% HR_{MAX}, Zone 3 = 70-80% HR_{MAX}, Zone 4 = 80-90% HR_{MAX}, and Zone 5 = 90-100% HR_{MAX} (Fox et al., 2018). HR_{MAX} was determined using age-predicted equation (Berkelmans et al., 2018).

A simulated futsal game was played on a taraflex indoor court (20 x 40 m) and lasted 40 min and consisted of two 20-min halves separated by a 10-min interval. The official FIFA laws of the game were adopted, and a referee and a coach were appointed on the side-lines to provide technical and tactical guidance during the matches to create similar conditions to official matches. The players performed 25 min of their official game warm-up routines that consisted of 5-minute general sub-maximal aerobic warm-up exercises including jogging, running, skipping forward and backward, 5 min stretching and mobility, 5 min dynamic activities (short sprints, change of direction) and 10 min futsal-specific drills without and with opposition in a progressive pattern till shooting action.

The simulated game was organized as a friendly match against a futsal team from the 1st Division Futsal League. In line with the real game scenarios, where players were substituted by the national team coach during the game without considering the time they spent on the field or bench. Time-outs were also standardized by interrupting the game once per half when there were 10 minutes remaining in both halves.

Statistical Analysis

The data are presented as mean and standard deviation. The normal distribution of the data was assessed using the Shapiro-Wilk test. Inertial movement analysis variables, based on playing position, were analysed with the Kruskal-Wallis H test. Group comparisons were conducted using the Mann-Whitney U test, and a Bonferroni correction was applied. A significance level of $p<0.05$ was considered. The statistical analysis was performed using the SPSS 25 software package.

RESULTS

The movement characteristics of hearing-impaired futsal players total PL_{TOTAL}, $PL \cdot min^{-1}$, PL_{PEAK}, and PL_{HIGH} showed significant differences between groups. The distinctions were observed mainly between defender and winger positions, except for the PL_{PEAK} and PL_{VHIGH} (Table 1). Significant differences were observed only in the PL_{VHIGH} variable between winger and pivot positions ($p<0.05$). There were no significant differences in PL_{PEAK} across playing positions ($p>0.05$). Specific PL variables show varying responses among playing positions, with notable distinctions between defenders and wingers. Additionally, the PL_{VHIGH} variable stands out as the only significant difference when comparing wingers and pivots. The consistency in PL_{PEAK} across positions implies uniformity in this aspect of PL.

Differences in external load across playing positions were observed. ACC_{LOW}, ACC_{MED}, ACC_{HIGH}, DEC_{LOW}, $COD\text{-}L_{LOW}$, and $COD\text{-}L_{MED}$ showed significant variances between wingers and defenders, favoring wingers. Additionally, $COD\text{-}L_{HIGH}$ differed significantly between pivots and defenders, and $COD\text{-}R_{LOW}$ differed between pivots and wingers ($p<0.05$). DEC_{MED}, DEC_{HIGH}, $COD\text{-}R_{MED}$, $COD\text{-}R_{HIGH}$ did not differ between playing positions ($p< 0.05$).

Table 1. PL variables measures during the match and comparison for the playing positions.

Variables	Mean ± SD	Position	Mean Rank	Significant Comparisons	Adjusted p	U
PL_{TOTAL} (a.u)	479.73 ± .00 672.58 ± 48.09 355.14 ± 50.21 545.00 ± 146.22	Pivot Winger Defender Total	5 9.5 2	Defender-Winger	0.009	7.5
PL_{PEAK} (a.u)	4.27 ± .00 5.50 ± .78 5.44 ± 1.30 5.18 ± .94	Pivot Winger Defender Total	3 7.8 7.3	-	0142	9.5
$PL{\cdot}min^{-1}$ (a.u)	4.53 ± .00 6.34 ± .45 3.35 ± .47 5.14 ± 1.37	Pivot Winger Defender Total	5 9.5 2	Defender-Winger	0.009	7.5
EXP_{EFF} (no)	30,00 ± .00 32.83 ± 6.52 23.00 ± 1.73 29.66 ± 6.12	Pivot Winger Defender Total	7 8.5 2	Defender-Winger	0.030	6.5
PL_{LOW} (a.u)	278.00 ± .00 317.16 ± 46.04 176.66 ± 40.99 272.25 ± 69.78	Pivot Winger Defender Total	7 8.5 2	Defender-Winger	0.030	6.5
PL_{MED} (a.u)	173.00 ± .00 271.50 ± 24.60 151.00 ± 10.39 216.75 ± 60.25	Pivots Winger Defender Total	5 9.5 2	Defender-Winger	0.009	7.5
PL_{HIGH} (a.u)	24.00 ± .00 68.33 ± 16.63 20.66 ± 1.15 45.33 ± 26.55	Pivots Winger Defender Total	5 9.0 2	Defender-Winger	0.009	7.5
PL_{VHIGH} (a.u)	3.00 ± .00 11.50 ± 3.44 3,66 ± .57 7.41 ± 4.87	Pivots Winger Defender Total	2.5 9.5 4.5	Winger-Pivots	0.015	7

The analysis indicated that wingers generally exhibit different external load respones, including accelerations and left-sided changes of direction, compared to defenders. Additionally, differences were observed in left-sided changes of direction between pivotss and defenders, as well as in right-sided changes of direction between pivots and wingers. The absence of significant differences in certain variables suggests similarities in deceleration and right-sided changes of direction between specific playing positions (Table 2).

Among the internal load parameters associated with HR variables, distinctions were identified solely in HR_{MAX}, $\%HR_{MAX}$, and duration of HR_{ZONE3} when comparing pivot and winger positions ($p<0.05$). Conversely, HR_{MIN}, HR_{AVE}, duration of HR_{ZONE3}, HR_{ZONE4} exhibited uniformity across the playing positions ($p>0.05$). The internal load parameters related to HR demonstrated distinctions only in specific aspects (HR_{MAX}, $\%HR_{MAX}$, and duration of HR_{ZONE3}) when comparing pivots and wingers. The uniformity in other HR variables across playing positions suggests similarities in HR_{MIN}, HR_{AVE} and the duration spent in various HR zones (Table 3).

Table 2. External load variables during the match and comparison for the playing positions

Variables	Mean ± SD	Position	Mean Rank	Significant Comparisons	Adjusted p	U
ACC_{LOW}	40.0 ± .00	Pivot	5	Defender-Winger	0.009	7.5
	50.66 ± 11.89	Winger	9.5			
	19.66 ± 8.08	Defender	2			
	40.25 ± 15.84	Total				
ACC_{MED}	13.00 ± .00	Pivot	7	Defender-Winger	0.030	6.5
	14.66 ± 4.41	Winger	8.5			
	2.66 ± 1,15	Defender	2			
	11.25 ± 6.03	Total				
ACC_{HIGH}	4.00 ± .00	Pivot	5	Defender-Winger	0.008	7.5
	8.16 ± 1.194	Winger	9.5			
	3.00 ± .00	Defender	2			
	5.83 ± 2.79	Total				
DEC_{LOW}	68.00 ± .00	Pivot	5	Defender-Winger	0.009	7.5
	81.00 ± 8.65	Winger	9.5			
	33.33 ± 1.73	Defender	2			
	65.83 ± 21.12	Total				
DEC_{MED}	23.00 ± .00	Pivot	8	-	0.063	5.5
	21.83 ± 8.65	Winger	7.8			
	11.00 ± 1.73	Defender	2.3			
	19.41 ± 7.78	Total				
DEC_{HIGH}	5.00 ± .00	Pivot	4	-	0.099	4.6
	8.00 ± 2.00	Winger	8.6			
	3.66 ± 4.61	Defender	4.6			
	6.16 ± 3.09	Total				
$COD\text{-}L_{LOW}$	136.00 ± .00	Pivot	4	Defender-Winger	0.050	6.0
	205.33 ± 34.71	Winger	9.3			
	98.66 ± 68.70	Defender	3.3			
	161.33 ± 60.89	Total				
$COD\text{-}L_{MED}$	34.00 ± .00	Pivot	8	Defender-Winger	0.043	6.0
	35.83 ± 5.77	Winger	8			
	14.66 ± 6.35	Defender	2			
	30.08 ± 10.46	Total				
$COD\text{-}L_{HIGH}$	13.00 ± .00	Pivot	10	Defender-Pivot	0.041	7.1
	9.50 ± 4.13	Winger	6.5			
	5.33 ± 2.30	Defender	2.8			
	9.33 ± 4.09	Total				
$COD\text{-}R_{HIGH}$	73,0000 ± .00	Pivot	3	Winger-Pivot	0.035	6.1
	184.83 ± 48.67	Winger	9.1			
	103.00 ± 51.96	Defender	4.6			
	136.41 ± 65.17	Total				
$COD\text{-}R_{MED}$	17.00 ± .00	Pivot	3	-	0.61	5.5
	27.83 ± 5.56	Winger	8.6			
	22.00 ± 8.66	Defender	5.6			
	23.66 ± 7.07	Total				
$COD\text{-}R_{HIGH}$	8.00 ± .00	Pivot	9	-	0.050	5.9
	7.16 ± 2.04	Winger	7.3			
	4.33 ± .57	Defender	2.3			
	6.66 ± 2.01	Total				

Table 3. HR variables during the match and comparison for the playing positions

Variables	Mean ± SD	Position	Mean Rank	Significant Comparisons	Adjuste p	U
HR_{MIN} (beat/min)	70.0 ± .00	Pivot	11	-	0.052	6.3
	62.83 ± 3.92	Winger	5			
	64.00 ± 1.73	Defender	5			
	64.91 ± 4.14	Total				
HR_{AVE} (beat/min)	138.48 ± .00	Pivot	7	-	0.089	4.8
	144.17 ± 9.79	Winger	8.1			
	124.63 ± 7.47	Defender	2.6			
	137.86 ± 11.10	Total				
HR_{MAX} (beat/min)	213.00 ± .00	Pivot	11	Winger-Pivot	0.022	4.6
	188.66 ± 4.45	Winger	4.3			
	196.00 ± 8.66	Defender	6.3			
	196.58 ± 11.42	Total				
$\%HR_{MAX}$	73.27 ± .00	Pivot	2	Winger-Pivot	0.030	6.5
	82.21 ± 2.02	Winger	7.5			
	79.64 ± 3.02	Defender	7			
	79.33 ± 4.25	Total				
HR_{ZONE1} (min)	22.36 ± 4.10	Pivot	5.3	-	0.651	0.8
	24.76 ± 7.45	Winger	6.3			
	25.70 ± 4.19	Defender	8			
	24.39 ± 5.76	Total				
HR_{ZONE2} (min)	21.09 ± 7.04	Pivot	10.3	Winger-Pivot	0.031	6.5
	13.72 ± 1.71	Winger	3.8			
	17.00 ± 2.42	Defender	8			
	16.38 ± 4.63	Total				
HR_{ZONE3} (min)	13.68 ± 2.51	Pivot	5.3	-	0.802	0.4
	14.62 ± 3.80	Winger	7			
	14.57 ± 3.44	Defender	6.6			
	14.37 ± 3.17	Total				
HR_{ZONE4} (min)	10.05 ± 1.83	Pivot	2.6	-	0.058	5.6
	15.02 ± 2.83	Winger	8.6			
	11.65 ± .19	Defender	6			
	12.93 ± 3.06	Total				
HR_{ZONE5} (min)	6.08 ± 1.88	Pivot	7.6	-	0.807	0.4
	5.43 ± 2.44	Winger	6.1			
	4.81 ± 1.71	Defender	6			
	5.44 ± 2.02	Total				

DISCUSSION

The objective of this study was to investigate the activity profile and physiological demands incurred by elite deaf futsal players during a competitive match. This study represents the inaugural examination of the activity profile within the domain of elite deaf futsal players. The findings of the positional analysis in this study align with the activity profiles observed in nondeaf futsal players, where wingers typically exhibit greater player load compared to pivots and defenders (Serrano et al., 2020). The PL_{TOTAL} was higher among wingers (672.58±48.09) compared to pivots (479.73±0.00) and defenders (355.14±50.21). Similarly, the PL_{PEAK} was greater for wingers (5.50±0.78) compared to pivots (4.270±0.00) and defenders (5.44±1.30). Additionally, $PL \cdot min^{-1}$ was higher in wingers (6.34 ± 0.45) compared to pivots (4.53 ± 0.00) and defenders (3.35±0.47). Moreover, EXP_{EFF} were also observed to be elevated in the winger position (32.83±6.52) compared to pivots (30.00±0.00) and defenders (23.00±1.73). This occurrence is attributed to the inherent characteristics of the winger role, which typically involves sustained high-speed play, frequent bursts of explosive actions like dribbling, and extensive movement across the playing field.

In contrast to existing literature, our findings reveal that defenders exhibit the lowest PL variables, a phenomenon less commonly observed in prior studies. This contrasts with research involving nondeaf players, where defenders and wingers typically demonstrate similar activity levels, as documented by Serrano et al. (2020), while pivots tend to exhibit lower values. This

observation is partially attributed to the characteristic playing style of pivots, who often engage in short bursts of effort and maintain a stationary position near the goal throughout the match. Furthermore, defenders and wingers frequently engage in positional rotation during matches, where they assume diverse roles and responsibilities, thereby blurring the distinction between the positions (Caetano et al., 2015). However, positional rotation between defenders and wingers among deaf futsal players may be less prevalent due to communication challenges. In deaf futsal, the reliance on visual communication may slow down or complicate the coordination required for positional rotation. As a result, deaf futsal players may be less inclined to switch positions frequently, leading to less prevalent positional rotation compared to hearing counterparts. This notion may be supported by a study comparing performance-related parameters between deaf Czech Republic national team soccer players and hearing counterparts from the Czech Republic First League. Neuls et al. (2019), found no significant differences between deaf and non-deaf soccer players, likely because the testing procedures do not involve communication challenges, whereas effective communication is crucial during team gameplay.

In the assessment of external load variables, wingers demonstrated elevated levels of acceleration and deceleration activities, exhibiting significant disparities compared to defenders but not pivots. Concerning change of direction activities, wingers exhibited differences in COD-L_{LOW} and COD-L_{MED} compared to defenders, whereas COD-L_{HIGH} varied between defenders and pivots, and COD-R_{LOW} differed between wingers and pivots. Similar to our results, Ohmuro et al. (2020) observed a difference in the proportion of high intensity running without ball possession between the defender and winger positions, with wingers exhibiting higher values. Illa et al. (2020) demonstrated that wingers exhibit greater high deceleration distance (m/min) compared to defenders and pivots (wingers = 69±13; defenders = 66±12; and pivots = 63±13). According to Serrano et al. (2020), wingers demonstrated a greater distance covered in high-speed running (17.03 ± 4.86) compared to pivots (12.99 ± 4.37) and defenders (15.44 ± 5.10). Caetano et al. (2015) utilized a video automatic tracking system to investigate sprint frequency during futsal competitions, revealing that players typically engage in an average of 26±13.3 sprints per match. Regarding playing position, they found no variations in sprint distance covered, peak velocity, initial velocity, recovery time between consecutive sprints, or the number of sprints per minute in normally hearing players. This may be attributed to the sport's tactical and technical features, which promote player flexibility in changing positions, as well as the unlimited substitutions or the option of utilizing a "flying goalkeeper" during matches (Spyrou et al., 2020). However, this scenario differs in deaf players, which may account for the variance observed between playing positions.

Regarding the HR variables, significant differences were only observed between pivots and wingers for the following parameters: HR_{MAX}, $\%HR_{MAX}$, and duration of HR_{ZONE3}. This discovery is notably intriguing, as we observed significant differences in mechanical load type variables (e.g., ACC, DEC, COD, and PL) between playing positions. However, for internal load parameters, specifically HR variables, there were no meaningful differences. For instance, wingers exhibited the highest values for several variables, including PL_{TOTAL}, EXP_{EFF}, $PL \cdot min^{-1}$, ACC, DEC, and COD. Therefore, it would be reasonable to anticipate higher HR values among wingers in comparison to pivots and defenders. Conversely, one might expect lower HR values for defenders and pivots, given their comparatively lower mechanical loads. However, this scenario did not align with the findings of our study. Therefore, it can be inferred that deaf futsal players experienced difficulty in regulating their HR values, suggesting that factors other than the mechanical load of the games contributed to the increased HR observed in hearing-impaired players.

In team sports involving deaf individuals, communication challenges can significantly impact gameplay and team dynamics. Unlike hearing athletes who rely on verbal cues and auditory signals to communicate with teammates and coaches during matches, deaf athletes often rely on alternative methods of communication, such as sign language, gestures, or visual cues. The heightened physiological demands in deaf team sports may arise from the need for increased vigilance, coordination, and spatial awareness. Deaf athletes must rely more heavily on visual cues to interpret the movements of teammates, opponents, and the ball, requiring heightened focus and attention

throughout the game. This heightened vigilance can lead to increased physiological stress and energy expenditure compared to hearing athletes who may rely more on auditory cues.

Conclusion

In conclusion, mechanical demands of the simulated game differ based on the players' positions, underscoring the necessity for coaches to factor this variation into their preparation strategies. Moreover, players must manage their external and internal load effectively. Consequently, practitioners should prioritize implementing strategies for athletes' self-reconciliation and recovery to optimize performance and minimize the risk of fatigue-related issues. This emphasizes the crucial role of both coaching and athlete monitoring in maximizing athletic performance in hearing-impaired futsal players.

Practical Implication

The results of this study will contribute to a better understanding of the physical demands and physiological responses of hearing-impaired athletes in Futsal, which can inform the development of training programs, and strategies to optimize their performance and minimize the risk of injury. The findings will also provide valuable insights into the unique challenges faced by hearing-impaired athletes in team sports, highlighting the importance of inclusive sports and adaptive strategies to promote the participation and success of athletes with disabilities.

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. The authors received no financial support for the research, authorship, and/or publication of this article.

Ethics of the Research

This study was approved by Gazi University Ethical Commission with the reference number of 2023-134 and conducted in accordance with the ethical principles of Declaration of Helsinki.

Author Contributions

Study Design, SA, YA; Data Collection, SA, KK; Statistical Analysis, SA, KK; Data Interpretation, KK; Manuscript Preperation, SA, KK, YA; Literature Search, SA, KK, YA. All authors have read and agreed to the published version of the manuscript.

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International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

Strategic Performance and Work Passion and their Relationship to Emotional Exhaustion Among Futsal Coaches

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Abstract
This study aimed to identify strategic performance, passion for work, and their relationship to emotional exhaustion among futsal coaches, by preparing questionnaire forms to measure strategic performance, passion for work, and emotional exhaustion. The researcher used the descriptive approach using the correlational method, as it is the appropriate approach to the nature of this research, and the community is represented. For data conforming to a normal distribution, the independent samples test was used to analyze numerical comparisons between two different groups t-test. As a result, correlation coefficients between strategic performance and job passion in the research sample the t- value reached (160.2) below the significance level (0.05) was detected.Averages of correlation coefficients between strategic performance and emotional exhaustion in the research sample the t- value reached (2.160) below the significance level (0.05) was detected. The value of the correlation coefficient between strategic performance, work passion and emotional exhaustion in the research the t- value reached (2.160) below the significance level (0.05) was detected. In conclusion, the researcher recommended strengthening the role of Strategic performance and passion for work among futsal coaches.

Keywords
Keywords: Strategy, Passion, Emotional Exhaustion, Coach

INTRODUCTION

Starting with the strategic goals and work ethic, it is vital to look for modern and contemporary methods that are compatible with the scale of change and developments that sports institutions face, given the tremendous advancements in management and the changing environment in which they operate. However, developing a set of strategic performance indicators must be prioritized. which, by converting them into a collection of features that represent the performance necessary to be accomplished, conveys in a quantitative form the results and outcomes that must be produced in the short and long term and how they fulfill the objectives that the institution intends to achieve (Al- Haddad, et al. ,2022).

A modern and efficient management approach and set of tools that help them acquire a competitive edge and hold onto it for as long as possible, as well as assist them in selecting, implementing, and assessing the strategies they use, are now required due to the growing level of competition among sports teams and among coaches. It goes further since it assists in developing the strategies of the coach, converting them into strategic goals and these goals into strategic measurements that accomplish strategy evaluation and follow-up. All in all, it is a management tool that integrates into an integrated strategic management system (Aziz & Al-Haddad ,2022).

Received: 23 February 2024 ; **Revised** ; 15 April 2024 ; **Accepted:** 14 May 2024; **Published:** 25 May 2024

How to cite this article: Mohammed, W.Y., and Fahd, A.N. (2024). Strategic Performance and Work Passion and their Relationship to Emotional Exhaustion Among Futsal Coaches. *Int J Disabil Sports Health Sci*;7(3):630-636.https://doi.org/10.33438/ijdshs.1441963

Therefore, we find that there is an urgent need for change in work methods and tools so that they can keep pace with the rapid development that is sweeping the world today. There is no doubt that change in work methods and tools necessitates the need for development in the administrative work system and the need to develop their performance, develop their skills, and develop their ideas and personal capabilities (Naji, 2022), and since the team coach is the top of the pyramid in the training system, he must have qualifications to be able to take the correct decisions and procedures to address errors, therefore, the greatest weight in managing and directing administrative work falls on the team members, to take the team to progress through good strategic performance, and it should improve dealing according to a studied process by issuing decisions on the ground that are compatible with the available capabilities, and in a way that leads to the proper use of these capabilities and their rationalization.

The passion for work is the main driver for every person who wants to succeed. The passionate person is more interested in pursuing his passion than he is concerned with the results. Likewise, the passionate person does not get bored or despair, even if it takes a long time to reach the goals. As it is said (everyone who is passionate about his work is successful, but not necessarily every successful person is passionate about his work), as he has become Searching for what makes people happy, satisfied, and engaged at work is the focus of many researchers and practitioners in the field of career counseling (Mariya & Gitima, 2020).

Love of work, passion for it, and mastery of it are among the basic requirements that guarantee success in any professional field, especially for coaches who are responsible for helping the team achieve victory, as the presence of passion and desire among coaches gives them a strong motivation to be creative in it and master it, which makes us consider that love of work is a... An inevitable path to achieving goals and achieving professional goals that would raise a person's value and achieve a distinctive social and professional status for him, and through it gain the respect of others, and allow him to be an effective element in society, and to be influential in the environment in which he lives, and a provider for him. There is no dependency on him (Radhi & Shaalan, 2021).

Emotional exhaustion is one of the basic forces that is affected by anxiety or is a result of anxiety, and its most important causes are due to the monotony of daily behavior and the nature and monotony of work, and therefore that behavior and that monotony lead to exhaustion, and exhaustion is a waste of psychological energy as a result of life pressures, and Siderman believes Exhausted individuals often have energy, but their achievement is often less than this energy and their production is less than their capabilities (Al-Jubouri & Hussein, 2022).

Emotional exhaustion has been closely linked to psychological pressures, as it represents the highest levels of pressures that affect an individual's various relationships, including the individual's social relationships and interactions with his colleagues and friends, and extends to the family including it, as the phenomenon of emotional exhaustion accompanies the social, economic, educational, sports, and other areas of contemporary life. There is no field that is devoid of this phenomenon, but in varying forms. Workers in various humanitarian and productive professions fall under the influence of psychological fatigue due to the psychological and professional work pressures they are exposed to through their professional practice (Mariya & Gitima,2020).

From the above, strategic performance is one of the most important administrative elements that sports institutions must rely on in their work. Striving for advancement, progress, and victory is something that imposes itself on the importance of strategic performance in developing the passion for work among coaches, reducing the level of emotional exhaustion in them, and reaching the best desired goals, and through what Previously, through the researcher's review of previous research and studies, they noticed that there is a scarcity of studies that dealt with strategic performance, passion for work, and emotional exhaustion as a tool for the efficiency of futsal coaches' performance. Hence, the researcher believes that it is necessary to shed light on such a problem as an attempt to identify the strengths of the strategy for sports institutions and their development, as well as to identify the shortcomings and work to remedy them.

MATERIALS AND METHODS

Participant

The researcher used the descriptive method using the correlational method, as it is the

appropriate method for the nature of this research. The research community consists of futsal coaches in Iraq registered in the Iraqi Futsal Federation, who number (100) coaches. This study followed ethical standards and received approval from the Mustansiriyah University Social Sciences Ethics Committee Commission with date number 13 January 2024. Participant provided informed consent, with the volunteer form covering research details, risks, benefits, confidentiality, and participant rights. The research strictly adhered to the ethical principles of the Declaration of Helsinki, prioritizing participant's rights and well-being in design, procedures, and confidentiality measures.

Measures used in the research

The researcher prepared measures of strategic performance, work passion, and emotional exhaustion, for the purpose of informing the experts about them and stating their opinion in terms of accepting the paragraphs or not, also if there are paragraphs that need to be modified, deleted, or added, and after confirming the appropriate paragraphs, which received an acceptance rate of more than 80% of the respondents. The opinions of experts and specialists, as the strategic performance scale in its final form consisted of (39) items, with five answer alternatives (strongly agree, agree, neutral, disagree, strongly disagree), and the highest score for the scale was (155) and the lowest score was (31).

As for the work passion scale in its final form, it consists of (30) items and has five answer alternatives (strongly agree, agree, neutral, disagree, strongly disagree). The highest score for the scale was (150) and the lowest score was (30).

The emotional exhaustion scale in its final form is (29) and has five answer alternatives (applies to me completely, applies to me often, applies to me sometimes, does not apply to me, does not apply to me at all). The highest score for the scale was (145) and the lowest score was (29).

To determine the items' discriminating potential, the researcher statistically examined the scaled items by obtaining the internal consistency coefficient. In order to do this, Pearson's basic correlation coefficient was utilized. Following their presentation to experts and specialists to ascertain the authenticity of the nominated items, which totaled (39.30) items, and following the collection of all paragraphs were found to be legitimate when the researcher employed the (Ki^2) test to separate valid items from others. This is because the (Ki^2) value that was determined for these locations was approved since it was less than the tabular value of (3.84) at a significance level of (0.05) and a degree of freedom of (1). About the stability of the test (the scale), all metrics elements provide proof of the scale's apparent validity (the test that delivers near results or the same results if performed more than once in comparable conditions). After a week, the test was repeated using the same measurements on the same sample under the same settings, with the researcher using the two scales to the statistical analysis sample with 25 trainers. Using the basic Pearson correlation coefficient, the researcher was able to determine the reliability coefficient for the assessment form. The result was 0.80, 0.88, and 0.85, which is a positive indicator of the measures' stability.

Scientific foundations of standards

Reliability coefficient

Utilizing the test and retest approach, reliability was determined. The exam was administered to a sample of twenty-five trainers by the researcher to make sure the measurements achieved a high degree of dependability. A week later, the identical sample and circumstances from the first test were used for the reapplication of the test. The data were then compared using a basic correlation coefficient calculation. The first and second tests to determine the reliability coefficient between them Table (1)

Table 1. Shows the calculation of the reliability coefficient for the measures (strategic performance, work passion, emotional exhaustion)

Statistical	Calculated value	Tabular value	Sig level
Strategic performance	0.80	0.63	0.05
Work Passion	0.88		
Emotional exhaustion	0.85		

It was shown through Table (1) that there is a high, statistically significant correlation between the first and second tests of the measures (strategic performance, passion for work, emotional exhaustion) among the research sample, as the value of the reliability coefficient reached (0.80) (0.88) (0.85), respectively, and they are It is greater than the tabular value of (0.63) at a significance level of (0.05) and a degree of freedom (22).

Validity coefficient

The validity of each of the scales was verified by establishing content validity by presenting the scales (strategic performance, passion for work, and emotional exhaustion) to a group of experts and specialists in the field of management and organization science and sports psychology, and after reviewing the experts' answers to the scales' items and their suitability. For the research sample and the Iraqi environment, it was found that there was complete agreement (100%) on all items. On this basis, the validity of the test was confirmed and the standards were adopted in the research.

Objectivity

For the purpose of extracting the objectivity of the standards, the researcher applied the tests to the same statistical analysis sample, which consisted of (25) members. The researcher appointed (arbitrators) to mark the results of the two tests, as shown in Table (2).

Table 2. Shows an objective calculation of the measures (strategic performance, passion for work, emotional exhaustion)

Statistical	Calculated value	Tabular value	Sig level
Strategic performance	0.85	0.63	0.05
Work Passion	0.89		
Emotional exhaustion	0.86		

Through Table (2), it is clear to us that the values of the correlation coefficients for each of the measures (strategic performance, work passion, and emotional exhaustion), which amount to (0.85) (0.89) (0.86), respectively, are statistically significant and are greater than the tabulated value of (0.63).) at a significance level of (0.05) and a degree of freedom (22).

Statistical methods

The data were statistically analyzed using SPSS 20.0 (Statistical Package for the Social Sciences, Version 22.0, SPSS Inc., Chicago, IL, USA). The choice between parametric and non-parametric tests was based on the evaluation of the normal distribution using the Shapiro-Wilk test. Depending on the distribution of the data, the numerical variables were expressed either as mean ± standard deviation or as median (range from minimum to maximum). For data conforming to a normal distribution, the independent samples test was used to analyze numerical comparisons between two different groups t-test. The significance level was set at $p < 0.05$ for all tests.

RESULTS

Table 3. Shows the arithmetic means, standard deviations, and contortion coefficient for the scale of strategic performance, work passion, and emotional exhaustion among the research sample.

Statistical	X	SD	Skew ness	Distribution
Strategic performance	130.45	6.433	0.617	Equinoctial
Work Passion	129.4	9.249	-0.194	Equinoctial
Emotional exhaustion	73.1	5.853	0.051	Equinoctial

Mean (X), Std. Deviation (SD)

It is clear from Table (3) that the values of the skewness coefficient for the standards ranged between (0 - 0.937), which is less than ±1, and this indicates the moderate distribution of the sample in these variables.

Table 4. shows the arithmetic means, standard deviations, and values of correlation coefficients between strategic performance and work passion among the research sample.

Strategic performance		Work Passion		Calculated correlation coefficient (R) value	t value	Sig type
X	SD	X	SD			
130.455	6.433	129.4	9.249	0.777	4.451	Sig

Mean (X), Std. Deviation (SD)

The tabular (t) value reached (160.2) below the significance level (0.05).

Table 5. Shows the values of the means, standard deviations, and values of the correlation coefficients between strategic performance and emotional exhaustion among the research sample

Strategic performance		Emotional exhaustion		Calculated correlation coefficient (R) value	t value	Sig type
X	SD	X	SD			
130.455	6.433	1.73	853.5	758.0	191.4	Sig

Mean (X), Std. Deviation (SD)

The tabular (t) value reached (2.160) below the significance level (0.05).

Table 6. Shows the value of the correlation coefficient between strategic performance, work passion, and emotional exhaustion among the research sample

Statistical	Calculated correlation coefficient (R) value	Tabular value	Sig level
Strategic performance	751.0	104.4	Sig

The tabular (t) value reached (2.160) below the significance level (0.05).

DISCUSSION

It is clear from Table (4) that this indicates the existence of a statistically significant correlation between strategic performance and work passion. The researcher attributes this to the fact that futsal coaches have good strategic performance in the process of evaluating ideas that seek to develop the training process through work procedures and systems. Maintaining good relations between the administrative body, which is based on the principle of cooperation and integration in completing tasks through the influence and individual considerations that they have to perform tasks and duties without supervision. They are also characterized by sufficient skill and ability to adapt to changes and developments (Fahd, 2023) .This indicates that they bear responsibility and work to achieve their goals despite adherence to the federations system, and they bear the pressures and risks in order to advance the team and its development. This indicates that their policies and procedures are fairly clear, and they have a clear commitment to them, and this in turn leads to the completion of the tasks assigned to them and helps in achieving Achieving the passion for work that contributes to achieving the goals of sports clubs. The researcher believes that the role of strategic performance and passion for work leads to the responsibility of head coaches in achieving the goals of sports teams and working on their advancement and emphasizing their data (Fahd, 2024). The higher the strategic performance, the greater the passion for work they have. This result can be interpreted according to what was stated in the theory of the dual model of passion by Florinda et al., 2003. The passion for work is a state of continuous desire that depends on cognitive and emotional evaluations of the work, so here the research sample has a high level of passion for work (Ali & Malih, 2022).

That is, it gives high-level evaluations, not their work, and this depends on their performance of their job or work, as it is an important goal obtained after long suffering, especially in our society, as there are great difficulties facing coaches in obtaining an opportunity after waiting that may reach many years, so it consists They have a high-level desire for their work and then a feeling of passion towards their work and jobs, and they consider training the way through which they advance their lives. Through its financial returns, the individual can meet his needs in life and have a family and make him able to meet its requirements, and then he feels satisfied and passionate about working for training and proving their worth. Achieving achievement and victory for sports teams and taking first places in tournaments (Fahd, 2024).

It is clear from Table (5) that this indicates the existence of a statistically significant correlation between the role of strategic performance and emotional exhaustion. The researcher believes that it is difficult to reduce emotional exhaustion without the presence of strategic performance. We note that coaches have emotional exhaustion to a low degree, and this result differs from what was stated below. In the results of the study (Fahd, 2023) and the study (Naji, 2022).

This result can be interpreted according to what was stated in Hobfel's (Mariya & Gitima 2020) theory, which emphasized that a person reaches a state of emotional exhaustion when he feels that he has lost or is threatened with losing or losing all his resources, and that trainers, specifically in Iraqi society, despite the pressures and challenges In the work environment, however, paying attention to the human and emotional side and giving it priority at work is important because we are an Islamic society that deals with people as human beings before anything else (Al-Jubouri, &

Hussein, 2022) , as coaches take care of the team members, including the players and the administrative and technical staff, when they face a problem such as losing a loved one or being exposed to health problems or circumstances,poor social or psychological well-being they take this into consideration by tolerating his repeated request for leave or the decline in his performance, which gives us an explanation for the fact that trainers in our society have not exhausted all their energies and emotional resources from all aspects, whether at work, home (Abdul, & Hrebid, 2023), or society, as the emotionally exhausted person "reaches a stage of exhaustion." The energies are exhausted and no longer able to provide more. Thus, cases of emotional exhaustion can be dealt with proactively by working according to performance strategies designed to reduce team loss and confront problems by teaching emotionally exhausted individuals to reframe and evaluate situations as difficult and not stressful (Al-Jubouri, & Hussein, 2022).

Table 6 shows the presence of a statistically significant correlation between strategic performance, work passion, and emotional exhaustion. The researcher attributes this to the fact that strategic performance is one of the main pillars of work passion, as there must be dedication to work, prepared motivation, and the ability to Developing passion for work and love for achieving the work of sports club federations, as coaches in federations must possess several characteristics such as intelligence (Mariya & Gitima, 2020), talent, and the ability to analyze the problems and situations facing the work and make every effort to achieve the goals of sports team federations and feel pride and conviction for their work and their commitment to working in it. Whenever these characteristics are available, they will obtain a high degree of passion for work. The availability of both strategic performance and passion for work work to reduce emotional exhaustion, which in turn contributes clearly to improving training work and practices. This result is consistent with what was indicated by (Naji, 2023) that the presence of strategic performance and passion for the work of coaches of futsal teams is a necessity for advancing work and unleashing creative capabilities that allow launching into creative horizons and fields.

Conclusions

There is a connection between the role of strategic performance and the passion for work among futsal coaches**.** There is a connection between the role of strategic performance and passion for work in reducing the level of emotional exhaustion among futsal coaches.

Recommendations

Enhancing the role of strategic performance and passion for work among futsal coaches. Maintaining good working relationships between union members based on the principle of cooperation and integration in completing tasks. Thus, they can control the level of emotional exhaustion by supporting or rejecting values that have a significant impact on the training process.

ACKNOWLEDMENT

The authors would like to thank General Directorate of Diyala Education and Mustansiriyah University, Iraq for supporting their scientific works.

Conflict of Interest:

There is no personal or financial conflict of interest within the scope of the study.

Ethics of the Research

This study followed ethical standards and received approval from the Mustansiriyah University Social Sciences Ethics Committee Commission with date number 13 January 2024.

Author Contributions

Research Design- WYM and ANF ; Statistical analysis- ANF and WYM; Preparation of the article, WYM and ANF, ; Data Collection- Performed by ANF and WYM

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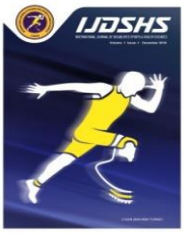

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

RESEARCH ARTICLE

Investigation Into The Stress-Coping Levels of Parents of Children with Autism Who Receive Physical Education

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Abstract
The aim of the study is to evaluate the demographic characteristics, stress and coping with stress levels of families with children with autism who receive services from autism sports club associations depending on various factors. A total of 134 people, 97 women (49,65±6,15) and 37 men (49,40±6,28) participated in the study. Personal Information Form (PIS), Stress Coping Styles Scale (SCSS) and Parent Stress Scale (PSS) were used as data collection tools. SPSS 22 package program was used to analyze the data obtained. Percentage and frequency values were used to analyze demographic characteristics. The t-test was used for the gender variable of the SPSAS, One-Way Anova test was used for all other variables and Post Hoc Tukey test was used to determine the source of the difference. As a result of the study, there was no statistically significant difference between the sub-dimensions of the SBSAS according to the variables of gender, educational status and gender of the child with autism ($p>0.05$); when analyzed according to the age variable, a significant difference was found between the groups aged 25-35 years (2.66±0.58) and 45 years and over (2.30±0.71) in the helpless approach sub-dimension ($p<0.05$). A statistically significant difference was found in families with male children (50.29±5.66) in the comparison of the PBSS according to gender variable ($p<0.05$). According to the results of the study, it was found that parents felt more helpless as they got older and parents with male children with autism experienced more stress than parents with female children with autism.

Keywords
Autism, Coping With Stress, Physical Education, Parenting Stress Level

INTRODUCTION

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental disorder that begins early in life and lasts throughout life, characterized by delayed social relationships, communication, behavioral and cognitive development, and stereotyped behaviors (APA, 2013). The difficulties experienced by individuals with ASD in communicating and maintaining communication skills cause them to perform lower than their peers with typical development as well as their peers with other developmental disabilities (Kizir, 2021). Studies have shown that the behaviors acquired in physical and psycho-social areas through sports and games in individuals with ASD are transferred to similar situations that are necessary and relevant in daily life (Kaya & Alp, 2022).

While every parent is expecting a healthy baby, the birth of a baby with autism causes the family to be caught unprepared and causes their lives to be seriously negatively shaped. From the moment the child is diagnosed with autism, it affects both the family and the child and requires lifelong interventions (Töret et al. 2014). Considering that autism is a lifelong developmental condition that is characterized by language problems, introversion, repetitive movements and limitations in relationships in the first three years of life, it is known that both children and their families

Received: 27 February 2024 ; **Revised** ; 27 March 2024 ; **Accepted:** 03 May 2024; **Published:** 25 May 2024
How to cite this article: Avcı, M.A., Ulutürk, K., Pehlivan, A., Bağmen Kaya, A., and Karabacak, S. (2024). Investigation Into The Stress-Coping Levels of Parents of Children With Autism Who Receive Physical Education. *Int J Disabil Sports Health Sci*;7(3):637-647.https://doi.org/10.33438/ijdshs.1443716

are significantly affected by this process (Arslan, 2020; Durukan et al. 2010). The diagnosis of autism in children causes traumatic effects on all family members, including parents (Atılgan & Kolburan, 2019), extreme stress and psychological problems (Köksal & Erciyes, 2021). Children with disabilities remain dependent on their parents to varying degrees because they are affected by disability in terms of certain developmental areas. This situation is a source of stress that requires constant coping for the family (Bilal & Dağ, 2005). Stress is a situation that needs to be coped with; if coping strategies fail, psychological health deteriorates and the emergence of psychopathological symptoms is inevitable (Korkmaz, et al. 2014). For parents with children with autism, stress is seen as an important health problem in the struggle to adapt to changing life conditions with their children, to develop themselves, to solve their problems, and to become an individual who can adapt to existing conditions (Cengiz et al. 2016).

In our country, it is seen that families with ASD children have started to have the awareness that physical activities are important in the development of their children, and that they have demands and searches for the necessity of physical activities within educational activities or after school (Aydın & Sarol, 2014).In a study, it was stated that the lifestyles of the parents of children with ASD attending sports schools were significantly differentiated (Şarvan Cengiz et al. 2016). In a study evaluating the views of parents of children with ASD on sports, parents of children with ASD who play sports stated that sports provide positive contributions to their children. Considering the contributions of sports to the life skills of individuals with ASD, it was emphasized that physical education teachers should be employed especially in special education centers and compulsory education, sports facilities should be brought to an adequate level in these centers, and disabled sports clubs should be increased (İnce, 2017). In a meta-analysis study on the importance of physical education and sports in children with ASD, it was observed that physical education and sports programs provided positive improvements in motor skills and motor performance of children with autism and behavioral problems related to autism. Therefore, they emphasized that individuals with ASD should take part in sports activity programs (Kaya & Alp, 2022).

Due to the positive effect of sports on individuals with autism, families are looking for their children to participate in active sports in many sports centers. One of the sports activity centers is the autism sports club associations, where children with autism are given the opportunity to practice various sports activities (table tennis, skill balance coordination, running, swimming, etc.), daily living skills and self-care skills under the guidance of a sports leader. These institutions provide 24 hour inpatient or daytime services to each child with ASD by a sports instructor. These services are preferred by families to reduce the burden on their children and individual education programs with individuals with ASD are preferred by families because they provide a decrease in autistic behavior problems and improvement in physical fitness.

In the literature studies on coping with stress in families with disabilities, there are studies on coping with stress and mental states of families with disabled and especially mentally disabled children (Şengül & Baykan, 2013; Ayyıldız et al. 2012; Korkmaz et al. 2014; Kaytez et al. 2015; Yıldırım & Conk, 2005) and studies on coping with stress in families with children with disabilities of parents with children with autism attending sports schools (Cengiz et al. 2016). It has been observed that there are no studies on the demographic characteristics of families with children with autism who receive services from autism sports club associations and whether these services have an effect on coping with stress.

Accordingly, the aim of this study is to examine the stress and coping with stress levels of families receiving services from autism sports club associations, parents of sports services provided to children with ASD in terms of various factors and to evaluate the relationship between them.

Our hypotheses in the study are; it will contribute positively to the stress and stress coping styles of families receiving services from sports training centers, stress and stress levels will increase as the age of parents increases, and there will be an increase in favor of women in terms of gender.

MATERIALS AND METHODS

In this study, the stress coping styles of families with children with autism who receive services from autism sports club associations and the stress status of parents were examined. In

addition, it was also examined whether the data obtained from the two measurement tools differed according to various variables. In the research, a descriptive study was conducted to determine the situation and the survey method was used. In survey research, a description is generally made by determining the existing situation related to the research subject (Büyüköztürk, 2016). With the data obtained from the research because of the screening method, the stress levels of the parents were described and the significance levels of their relationships with different variables were determined. This study followed ethical standards and received approval from the Halic University Non-invasive Clinical Research Ethics Committee, reference number (no: 145, date 26.06.2021) Participant provided informed consent, with the volunteer form covering research details, risks, benefits, confidentiality, and participant rights. The research strictly adhered to the ethical principles of the Declaration of Helsinki, prioritizing participant's rights and wellbeing in design, procedures, and confidentiality measures.

Study Group

The population of the study consists of families receiving services from autism sports clubs in Turkey. The sample group of the study was determined by non-random convenience sampling method. The sample consists of parents living in the Marmara region and receiving services from autism sports clubs. A total of 134 volunteer parents participated in the study.

A total of 134 people, 97 women (49.65±6.15) and 37 men (49.40±6.28) participated in the study.

Collection Tools

In the study, PIF, SCSS and PSS were used as data collection tools. Within the scope of the research, data were collected through online questionnaire forms.

Personal Information Form

The form was developed by the researchers within the scope of the literature and consisted of 4 questions to determine the demographic status of the parents included in the study (age, gender, gender of their children and years of practicing sports).

Stress Coping Styles Scale (SCSS)

Developed by Folkman and Lazarus (1985), the scale, whose Turkish validity and reliability study was conducted by Şahin and Durak (1995), measures the methods and thoughts that people use in stress situations. It is a 4-point Likert-type scale ranging from 0 to 3. It consists of a total of 30 items and has parameters in 5 subscales (self-confident approach, optimistic approach, helpless approach, submissive approach and approach to resort to social support). The increase in subscale scores indicates the frequency of using that method. Self-confident approach, optimistic approach and approach of seeking social support are considered as active methods of coping with stress, while helpless approach and submissive approach are considered as passive methods.

Parent Stress Scale (PSS)

It was developed by Özmen and Özmen (2012) to measure the stress experienced by parents in their relationships with their children in daily life. It was deemed appropriate by the developer of the scale that the Parent Stress Scale can also be used to measure the stress levels of parents of children with problematic behaviors (Özmen & Özmen, 2012). The PSS has a single factor consisting of 16 items. Cronbach's alpha coefficient of the scale was measured as .85. The scale is a four-point Likert type (Always=4, Frequently=3, Sometimes=2, Never=1). The lowest score that can be obtained from the scale is 16 and the highest score is 64. A high score on the scale indicates a high level of parental stress.

Statistical analysis

SPSS 22 package program was used to analyze the data obtained. Percentage and frequency values were used to analyze demographic characteristics. The t-test was performed for the gender variable of the SBSAS, One-Way Anova test for all other variables and Post Hoc Turkey test was performed to determine the source of the difference.

RESULTS

In this section, the results of the statistical analyses applied to the data collected within the scope of the research are presented. In the first section, demographic variables (age, gender, marital status, education level, age of the child, gender of the child, diagnosis of the child) are analysed. Findings related to PSS and SCSS levels were included.

Table 1. Demographic characteristics of the research group

Gender	**N**	**%**
Female	97	72.4
Male	37	27.6
AGE		
Between the ages of 25 and 35 years	35	26.1
Between the ages 36 and 45 years	73	54.5
At and over the age of 45 years	26	19.4
Academic background		
Primary School	23	17.2
Middle School	21	15.7
High School	39	29.1
Undergraduate	40	29.9
Postgraduate	11	8.2
Gender of the Child		
Girl	25	18.7
Boy	109	81.3
Age of the Child		
Between the ages of 1 and 5 years	27	20.1
Between the ages of 6 and 10 years	50	37.3
Between the ages of 11 and 15 years	23	17.2
Between the ages of 16 and 20 years	15	11.2
At and over the age of 21 years	19	14.2
Total	134	100.0

When the demographic characteristics of the research group are analyzed in Table 1, 72.4% of the participants are female and 27.6% are male. 26.1% of the participants were between the ages of 25-35, 54.5% were between the ages of 36-45 and 19.4% were 45 years and over. In addition, 29.9% of the participants were undergraduate graduates, while 8.2% were postgraduate graduates. While 18.7% of the participants were parents of girls with autism, 81.3% were parents of boys with autism. While 37 .3% of the participants' children with autism were between the ages of 6-10, 11.2% were 16-20 years and older.

Tablo: 2. Reliability analysis results of the (SCSS) and (PSS)

Ölçek / Ölçek Alt Boyutları	**Madde Sayısı**	**Cronbach's Alpha**
Self-Confident Approach	7	0,862
Optimistic Approach	5	0,722
Helpless Approach	8	0,707
Submissive Approach	6	0,738
Social Support Seeking Approach	4	0,756
Stress Coping Styles Scale Total	30	0,769
Parental Stress Scale	16	0,891

$p<0.05$

Cronbach's Alpha reliability analysis was performed to determine the reliability of the SCSS(SPSS) and (PSS) and the reliability of the PSSS was found to be α=0.769 and the reliability of the PSS was found to be α=0.891. In addition, the reliability of the subscales of SPSS is respectively: Self-Confident Approach (7) α=0.862, Optimistic Approach (5) α=0.722, Helpless Approach (8) α=0.707, Submissive Approach (6) α=0.738 and Seeking Social Support. (4) α=0.756 was found.

Table 3. Descriptive statistical results of SCSS sub-dimensions

Dimensions	N	Min	Max	x̄	ss
Self-Confident A.	134	1.57	4.00	3.2463	.61249
Optimistic A.	134	1.60	4.00	2.8403	.57819
Helpless A.	134	1.25	4.00	2.4823	.58613
Submissive A.	134	1.00	3.50	2.2065	.57233
Social Support Seeking A.	134	1.25	4.00	2.8396	.57387

According to Table 4, in terms of the SCSS sub-dimensions of the participants, the highest value is "Self-Confident A." (3.24±0.61). This value is followed by "Optimistic A." (2.84±0.57), "Seeking Social Support A." (2.83±0.57), "Helpless A." (2.48±0.58) and "Submissive A." (2.2±0.57).

Table 4. Comparison of SCSS sub-dimensions depending of the variable of parent gender

Dimensions	Gender	n	x̄	ss	F	p
Self-Confident Approach	Female	97	3.2563	.60290	.053	.761
	Male	37	3.2201	.64470		
Optimistic Approach	Female	97	2.8309	.57470	.002	.763
	Male	37	2.8649	.59452		
Helpless Approach	Female	97	2.4923	.58430	.024	.751
	Male	37	2.4561	.59819		
Submissive Approach	Female	97	2.1615	.59095	1.629	.142
	Male	37	2.3243	.50909		
Social Support Seeking Approach	Female	97	2.8273	.55593	.372	.691
	Male	37	2.8716	.62534		

$p<0.05$

Statistically significant difference could not be found when SCSS sub-dimensions are examined depending on the parent gender variable ($p>0.05$).

Table 5. Comparison of SCSS sub-dimensions depending on the variable of age

Dimensions	Age	n	x̄	ss	p	Significance
Self-Confident Approach	25-35	35	3.3061	.61897	.790	
	36-45	73	3.2309	.59363		
	46 and over	26	3.2088	.67277		
	Total	134	3.2463	.61249		
Optimistic Approach	25-35	35	2.8000	.58209	.692	
	36-45	73	2.8795	.57902		
	46 and over	26	2.7846	.58494		
	Total	134	2.8403	.57819		
Helpless Approach	25-35	35	2.6679	.58390	**.047***	25-35 / at and over the age of 45 years
	36-45	73	2.4572	.51464		
	46 and over	26	2.3029	.71953		
	Total	134	2.4823	.58613		
Submissive Approach	25-35	35	2.1762	.53465	.907	
	36-45	73	2.2260	.55651		
	46 and over	26	2.1923	.67773		
	Total	134	2.2065	.57233		
Social Support Seeking Approach	25-35	35	2.7714	.61945	.642	
	36-45	73	2.8801	.54344		
	46 and over	26	2.8173	.60646		
	Total	134	2.8396	.57387		

$p<0.05$

When the SCSS was analyzed according to the age variable, it was determined that the group between the ages of 25-35 (2.66±0.58) scored significantly higher than the group aged 45 years and over (2.30±0.71) in the Helpless approach sub-dimension ($p<0.05$).

Table 6. Comparison of SCSS sub-dimensions depending on the variable of academic background

Dimensions	Academic Background	n	x̄	ss	p
Self-Confident Approach	Primary School	23	3.2547	.63736	.606
	Middle School	21	3.4286	.59074	
	High School	39	3.2491	.50849	
	Undergraduate	40	3.1679	.71090	
	Postgraduate	11	3.1558	.58364	
	Total	134	3.2463	.61249	
Optimistic Approach	Primary School	23	2.8000	.57840	.107
	Middle School	21	3.1143	.62792	
	High School	39	2.7590	.52752	
	Undergraduate	40	2.8650	.60492	
	Postgraduate	11	2.6000	.42895	
	Total	134	2.8403	.57819	
Helpless Approach	Primary School	23	2.4728	.66460	.106
	Middle School	21	2.5476	.66670	
	High School	39	2.5705	.56253	
	Undergraduate	40	2.4906	.52378	
	Postgraduate	11	2.0341	.41867	
	Total	134	2.4823	.58613	
Submissive Approach	Primary School	23	2.2246	.60220	.254
	Middle School	21	2.4603	.67062	
	High School	39	2.1368	.50851	
	Undergraduate	40	2.1583	.58708	
	Postgraduate	11	2.1061	.39632	
	Total	134	2.2065	.57233	
Social Support Seeking Approach	Primary School	23	2.9130	.53624	.319
	Middle School	21	2.5952	.61986	
	High School	39	2.8590	.53124	
	Undergraduate	40	2.8813	.62014	
	Postgraduate	11	2.9318	.50114	
	Total	134	2.8396	.57387	

p<0.05

Statistically significant difference could not be found when SCSS sub-dimensions are examined depending on the academic background variable (p>0.05).

Table 7. Comparison of SCSS sub-dimensions depending on the variable of child gender

Dimensions	Child's Gender	n	x̄	ss	F	p
Self-Confident Approach	Girl	25	3.0857	.69620	2.868	.147
	Boy	109	3.2831	.58901		
Optimistic Approach	Girl	25	2.6400	.62183	.502	.054
	Boy	109	2.8862	.56067		
Helpless Approach	Girl	25	2.4050	.59978	.280	.467
	Boy	109	2.5000	.58432		
Submissive Approach	Girl	25	2.0933	.66158	1.669	.275
	Boy	109	2.2324	.54998		
Social Support Seeking Approach	Girl	25	2.7800	.54160	.313	.567
	Boy	109	2.8532	.58255		

p<0.05

Statistically significant difference could not be found when SCSS sub-dimensions are examined depending on the child's gender variable (p>0.05).

When SCSS was examined according to the child's age variable, a significant difference was found in the optimistic approach and helpless approach sub-dimensions. It is observed that the difference in the sub-dimension of optimistic approach arises from the age of 1-5 years (2.57±0.47) and 11-15 years (3.08±0.60) and difference in the sub-dimension of helpless approach arises from 1-5 years of age (2.81±0.50) and 6-10 years of age (2.35±0.55).

Tablo 8. Comparison of SCSS sub-dimensions depending on the variable of child's age

Dimensions	Child's Age	n	x̄	ss	p	
Self-Confident Approach	1-5 years of age	27	3.1164	.64625	.733	
	6-10 years of age	50	3.2829	.59464		
	11-15 years of age	23	3.2547	.62561		
	16-20 years of age	15	3.3714	.43128		
	21 and over	19	3.2256	.73512		
	Total	134	3.2463	.61249		
Optimistic Approach	1-5 years of age	27	2.5704	.47943	**.015***	1-5 / 11-15
	6-10 years of age	50	2.8320	.58044		
	11-15 years of age	23	3.0870	.60250		
	16-20 years of age	15	3.0400	.47929		
	21 and over	19	2.7895	.61273		
	Total	134	2.8403	.57819		
Helpless Approach	1-5 years of age	27	2.8148	.50996	**.017***	1-5 / 6-10
	6-10 years of age	50	2.3500	.55097		
	11-15 years of age	23	2.4457	.48240		
	16-20 years of age	15	2.4917	.64515		
	21 and over	19	2.3947	.70988		
	Total	134	2.4823	.58613		
Submissive Approach	1-5 years of age	27	2.2037	.54171	.633	
	6-10 years of age	50	2.1233	.52360		
	11-15 years of age	23	2.3333	.56854		
	16-20 years of age	15	2.1889	.68390		
	21 and over	19	2.2895	.66630		
	Total	134	2.2065	.57233		
Social Support Seeking Approach	1-5 years of age	27	2.7500	.50000	.126	
	6-10 years of age	50	2.9250	.58521		
	11-15 years of age	23	2.5978	.58746		
	16-20 years of age	15	2.9167	.44987		
	21 and over	19	2.9737	.65561		
	Total	134	2.8396	.57387		

p<0.05

Table 9. Values as to scores of PSS

Gender	n	x̄	ss	F	P
Female	97	49.6598	6.15069	.002	.832
Male	37	49.4054	6.28251		
Age					
From 25 to 35 years	35	49.7429	5.27671	1.472	.233
From to 36-45 years	73	50.1644	6.21605		
At and over 45 years	26	47.7692	6.97027		
Academic Background					
Primary School	23	50.5652	7.35976	1.848	.124
Middle School	21	52.2381	7.79682		
High School	39	48.4872	5.04648		
Undergraduate	40	49.3250	5.48839		
Postgraduate	11	47.3636	4.80151		
Child's Gender					
Girl	25	46.5200	7.35482	.174	**.005***
Boy	109	50.2936	5.66553		
Child's Age					
From 1 to 5 years	27	48.7037	4.27708	.259	.904
From 6 to 10 years	50	49.5000	6.28653		
From 11 to 15 years	23	49.8261	7.16464		
From 16 to 20 years	15	50.5333	6.66405		
At and over 21 years	19	50.0526	6.87567		
Total					

p<0.05

When the PSS score was compared according to the gender of the child, a statistically significant difference was found ($p<0.05$). It has been observed that parents of boys with autism have higher stress levels. No significant difference was found according to the variables of parent, age, academic background and child's age ($p>0.05$). Correlative analyses of variables for the scales SCSS and PSS are provided on Table 10.

Table.10. Correlations for the variables of SCSS and PSS

	x̄	ss	1	2	3	4	5	6
1 Self-Confident A.	3.246	0.612	1					
2 Optimistic A.	2.840	0.578	.714**	1				
3 Helpless A.	2.482	0.586	-0.082	0.013	1			
4 Submissive A.	2.206	0.572	0.168	.265**	.518**	1		
5 Social Support Seeking A.	2.839	0.573	.193*	0.031	-268**	-286**	1	
6 Stress Level	2.251	0.571	-504**	-367**	.475**	0.169	-248	1
**** p<0.01, * p<0.05**								

In table 10; a positive correlation was found between the optimistic approach variable and the self-confident approach ($r=0.714$, $p<0.01$) variable. A positive correlation was found between the submissive approach variable and the optimistic approach ($r=0.265$, $p<0.01$) and helpless approach ($r=0.518$, $p<0.01$). A negative correlation was found between the social support seeking approach variable and helpless approach ($r=-0.268$, $p<0.01$) and submissive approach ($r=-0.286$, $p<0.01$). Stress level variable was found to have negative relation with self-confident approach ($r=-0.504$, $p<0.01$), optimistic approach ($r=-0.367$, $p<0.01$), social support seeking approach ($r=-0.248$, $p<0.01$) and positive relation with helpless approach (r). =0.475, $p<0.01$).

DISCUSSION

In this section, it was aimed to evaluate the stress levels and coping styles (self-confident approach, optimistic approach, self-blaming approach, submissive approach and social support seeking approach) of parents with children with autism receiving services from autism sports club associations. According to the findings, there was no statistically significant difference ($p>0.05$) when the sub-dimensions of the SCSS were analyzed according to the variables of gender, educational status and gender of the child with ASD; when analyzed according to the age variable of the parents, a significant difference ($p=0.048$) was found between the groups aged 25-35 years (2.66±0.58) and 45 years and over (2.30±0.71) in the helpless approach sub-dimension ($p<0.05$). In the study in which the relationship between socio-demographic characteristics and stress levels of families with children with ASD was examined, it was stated that the stress caused by living with ASD is an important indicator that different levels can be reached under different socio-demographic conditions. When the effect of the gender of the parent on the variables was examined in the study, the stress level of female parents was significantly higher. There was no significant difference in the sub-dimensions of coping styles with stress (Koçhan, 2019). Similarly, Güneysucu (2010) found no significant difference in the parameters of age, educational status, occupational status, and gender of the child in the examination of stress coping styles of fathers with educable mentally disabled children.

In the study, no significant difference was found in the gender variable. In Koçhan's (2019) study, no significant difference was measured between the scores of children of different genders in terms of parental stress, coping styles and wise awareness variables. In the study conducted to determine the stress coping styles of mothers of children with disabilities, it was found that mothers with healthy children had higher self-confident approach and optimistic approach styles, while mothers with disabilities had higher helpless approach and submissive approach styles among the subscales of stress coping styles. As a result of the same study, no significant difference was found in the subscales of stress coping styles of mothers with disabled and healthy children according to their education levels (Aydın, 2019). In another study, it was found that parents with mentally disabled children used self-confident approach and optimistic approach styles more than mothers with healthy children (Karadağ, 2017). It was observed

that the results obtained in the study were in parallel with the studies conducted.

In the study, no significant difference was found in the education variable in the sub-dimensions of SCSS ($p<0.05$). In the literature review, it is seen that there are different results in educational status and stress levels. While some studies did not find significant differences, some studies found significant differences at certain levels of educational status. Aydın (2019) did not find a significant difference in the subscales of stress coping styles of mothers with disabled and healthy children according to their educational levels. Bilal and Dağ (2005) compared stress, coping with stress and locus of control in mothers of children with and without educable intellectual disabilities and found no significant difference in the total and sub-factor scores of SBTÖ. Koçhan (2019) examined the effect of parents' education level in terms of scale scores in his study and found that the stress level of secondary school graduate parents was the highest. Kaytez et al. (2015) examined the needs and stress levels of families with disabled children in their study and showed that the highest stress level was in high school graduate parents. They interpreted this as the differentiation of the level of education, regardless of the level of education of the parent, the level of stress may be high due to the uncertainty of the future with the disability of the child or the effect of other problems. In the evaluation of the stress coping methods of mothers with mentally disabled children, a significant difference was found between the helpless approach score ($p=0.028$), submissive approach score ($p=0.002$) and seeking social support ($p=0.004$) scores of the SCSS according to the educational level of the mothers. In terms of helpless and submissive approaches, which are ineffective coping methods with stress, mothers who graduated from high school had higher scores than mothers who graduated from primary school ($p=0.002$ for helpless approach, $p=0.001$ for submissive approach) and illiterate mothers ($p=0.005$ for submissive approach). In the sub-dimension of seeking social support, high school graduate mothers scored lower than illiterate ($p=0.001$) and primary school graduate mothers ($p=0.002$) (Ayyıldız et al. 2012).

In the study, no significant difference was found in the parameters of gender change of the child. Cengiz et al. (2016) found a statistically significant difference ($p<0.05$) when the comparison of families with children with autism attending sports schools was made according to the gender of the child in the SBSS. It was observed that the stress levels of parents with male autistic children were higher. In Koçhan's (2019) study, a significant difference was found in the optimistic approach and helpless approach sub-dimensions of the coping styles with stress scale according to the age of the child. The difference was found in the optimistic approach sub-dimension in the 1-5 age (2.57 ± 0.47) and 11-15 age (3.08 ± 0.60) groups, and in the helpless approach sub-dimension in the 1-5 age (2.81 ± 0.50) and 6-10 age (2.35 ± 0.55) groups. In some studies, the difference in the gender variable may be due to the fact that ASD is more common in boys. However, in this study, some results were obtained to support the literature.

When the SCSS was analysed according to the age variable of the parents, a significant difference ($p=0.048$) was found between the groups aged 25-35 years (2.66 ± 0.58) and 45 years and over (2.30 ± 0.71) in the helpless approach sub-dimension ($p<0.05$). Güneysucu (2010) found no significant difference in the age variable in the examination of stress coping styles of fathers with educable mentally disabled children. In his study, Çan Arslan (2010) showed that the scores obtained from SCSS did not create a significant difference in age and education level variables. However, families experience anxiety with their disabled children after their own deaths (Özmen & Çetinkaya, 2012). We think that this situation increases the future anxiety of their children with the advancing age of the families and this causes them to feel helpless. Meeting the needs and wishes of the child, trying to maintain the family order, overcoming different and unfamiliar behaviours, constantly supervising the child who is not aware of any danger around him/her and cannot protect himself/herself, and trying to meet his/her individual needs and the needs of other members of the family are tiring and stressful for every family. Coping with stress is necessary to protect the physical and mental health of autistic parents and to lead a quality life, but it does not mean the complete elimination of stress. What is important is to reduce the amount of stress and factors that negatively affect the lives of parents, to reduce or eliminate the emotional tension caused by stress factors, to resist the emotional tension and to keep the reactions strong (Cengiz et al. 2016).

In the study, no significant difference was found according to the variables of parents, age, educational status and age of the child (p>0.05). We think that this situation is due to the institution where they receive support in the care of their children and the development they see in the education they receive. A statistically significant difference was found when the comparison was made according to the variable of gender (p<0,05). It has been known for many years that the incidence of autism in males is higher than in females (Akçakın, 2002). In epidemiological studies, the male-female ratio in autism spectrum disorder (ASD) is approximately 4:1 in boys (Baio et al. 2018; Fombonne et al. 2011; Hiller et al. 2016; Holtmann et al. 2010), while some meta-analyses have found that the actual ratio is probably close to 3:1 (Ratto et al. 2018). It has been reported that autism leads to more severe disabilities in girls, girls have lower intellectual achievement (McLennan et al. 1993) and are more socially backward (Halladay et al. 2015). This may be thought to be due to the fact that boys are more likely to have autism and are more affected by autism.

Conclusions

In the correlation results related to the variables of SCSS and PSS; positive correlation of Optimistic Approach variable with Self-Confident Approach variable (r=0.714, p<0.01) was found. Submissive Approach variable had a positive correlation with Optimistic Approach (r=0.265, p<0.01) and Helpless Approach (r=0.518, p<0.01). Social Support Seeking Approach variable had a negative correlation with Helpless Approach (r=-0.268, p<0.01) and Submissive Approach (r=-0.286, p<0.01). Stress Level Variable had a negative correlation with Confident Approach (r=-0.504, p<0.01), Optimistic Approach (r=-0.367, p<0.01) and Social Support Seeking Approach (r=-0.248, p<0.01) and a positive correlation with Helpless Approach (r=0.475, p<0.01).

Conflict of Interest:

There is no personal or financial conflict of interest within the scope of the study.

Ethics of the Research

This study followed ethical standards and received approval from the Mustansiriyah University Social Sciences Ethics Committee Commission with date number 13 January 2024.

Author Contributions

Research Design: MAA, KU and AP; Statistical analysis: MAA, ABK and SK; Preparation of the article, MAA, KU, AP, ABK, SK ; Data Collection- Performed by MAA, KU, AP, ABK, SK

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International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

The Effect of Eight Weeks of Zumba Exercises on Kinesiophobia Views in Sedentary Women

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Abstract
This study aims to analyze the effect of eight-week zumba exercises on kinesiophobia views in sedentary women. The survey model, one of the quantitative research methods, was used in the study. Forty sedentary female participants (age: 46.45±5.40 years, weight: 69.97±13.62 kg, height: 162.90±5.52 cm, BMI: 26.41±5.24 kg/m2) were randomly selected. Participants who met the inclusion and exclusion criteria were included in the study. Participants were enrolled in eight weeks (2 days/week) of outdoor Zumba training. Kinesiophobia levels were measured before and after the exercise with the Tampa Kinesiophobia Scale developed by Miller et al. Kinesiophobia levels were also analyzed according to smoking and alcohol use, chronic disease and income status. Repeated Measures Anova test was used for statistical analysis. The kinesiophobia levels of the participants did not change significantly after eight weeks of Zumba exercise ($p>0.05$). The kinesiophobia levels of the participants were not significantly affected by smoking [$F(2, 17) = .832$, $\eta 2p = .089$, $p = .452$], alcohol use [$F(2, 17) = .221$, $\eta 2p = .025$, $p = .804$], having a chronic disease [$F(2, 17) = 1.911$, $\eta 2p = .096$, $p = .184$], and income status [$F(2, 17) = .132$, $\eta 2p = .015$, $p = .878$]. However, the effect size of the change in those with chronic disease was within Cohen's high reference interval. In conclusion, eight weeks of Zumba exercises did not change the level of kinesiophobia in sedentary women. However, the most surprising finding in our study was that the effect size of the change in those with chronic disease parameters was very high. This may be thought to be due to the high baseline level of kinesiophobia in those with chronic diseases. Therefore, individuals with chronic diseases can perform Zumba exercises under the supervision of a doctor.

Keywords
Exercise, Kinesiophobia, Zumba, Women

INTRODUCTION

Regular exercise is thought to differentiate individuals physiologically, cognitively and spiritually (Perez & Greenwood-Robinson, 2009). Exercise; As a result of the daily activities and muscle mobility we do regularly in our lives, it provides changes in the vascular system (Lavie et al., 2019). Exercise or physical activities performed for a specific purpose increase living standards (Hamm et al., 2019). Aerobic dance exercises, which are one of the fun types of exercise, activate muscle activation and an exercise accompanied by music; flexibility, physical structure, body mass index, sports ability, basic motoric characteristics and affective areas also have a positive effect (Brene et al., 2014).

The idea that Zumba is an activity sport with music, rhythm and fun (Dalleck et al., 2015); revealed that people in our society generally do sports under the force of others or to lose weight rather than the purpose of doing physical activity for health (Tortop et al., 2010). Zumba, which is a type of exercise that can be done for a long time, has emerged for people to have fun and exercise, to make certain rhythmic movements with music, to

Received: 29 February 2024 ; **Revised** ; 03 May 2024 ; **Accepted:** 11 May 2024; **Published:** 25 May 2024

How to cite this article: Kurtoğlu, A., Çar, B., Kayacık, İ., and Yermakhanov, B. (2024). The Effect of Eight Weeks of Zumba Exercises on Kinesiophobia Views in Sedentary Women. *Int J Disabil Sports Health Sci*;7(3):648-654.https://doi.org/10.33438/ijdshs.1445032

make it fun, to burn more calories, to pass the time quickly and to be done for a long time (Vendramin et al., 2016).In their definition of Zumba; These are exercises that have a positive effect on the cardiovascular system, accelerate calorie burning, increase body endurance and increase the coordination and skill level of the person (Luettgen et al., 2012). Zumba exercises can correct body posture and increase aerobic endurance levels (Bidone et al., 2017).

When today's conditions are examined, it is seen that women generally spend their lives at home with certain jobs. It can be said that the global economic imbalance, especially with the Covid-19 pandemic, has negatively affected women's quality of life and they usually stay at home. Sedentary life is the ability of individuals to maintain their lives with minimal energy in their daily activities. This means that individuals' daily movements and resting heart rates are almost at the same level, and Zumba exercises are the main activities that enable individuals to have fun and do physical activity in modern life (Bidone et al., 2017). Thanks to Zumba, the risk of injury of individuals decreases and their physical capacity increases. The main purpose of exercising with music is to make individuals mentally ready for exercise and relax (Otto et al., 2011). It is thought that during Zumba exercises, changes will occur in women's heart rate levels, there will be differences in blood pressure and their physical capacity will increase (Cigusi et al., 2019). The continuous application of movements accompanied by music is predicted to contribute to the development of coordination and skill abilities in sedentary women.

Sedentary women are thought to be aware that they develop different muscle groups by doing kinesiophobia based on the concept of Zumba constitutes the main value of the research. Do eight-week zumba exercises have an effect on kinesiophobia views in sedentary women? Answers will be sought based on the question. As a result of this hypothesis, this research was conducted to determine what kind of positive or negative awareness about kinesiophobia will occur in sedentary women as a result of Zumba exercises. Technical terms, symbols Women are the basic unit of the society and they are pioneers of the nation movements that they do not use in their daily lives. When people experience an injury in any period of their lives, they may experience movement restriction due to this and may avoid movement with the fear of being injured again, which may even cause the person to avoid movement even at the end of the healing process due to the fear experienced. As a result, a condition called Kinesiophobia may occur (Yılmaz et al., 2011). Kinesiophobia is known as the recurrence of injuries and injuries that occur in the muscles during or after exercise (Kori et al., 1990). It is also known as being prejudiced against or avoiding events experienced due to certain injuries (Dere, 2020). Painful situations limit the mobility of individuals (Lungberg et al., 2006), and pain causes different reactions in the body (Tekin, 2010). When the literature is examined, it is determined that the effect of kinesiophobia causes psychological reactions such as not performing or preventing individuals from performing movements. Investigating the views on kinesiophobia based on the concept of Zumba constitutes the main value of the research. Do eight-week zumba exercises have an effect on kinesiophobia views in sedentary women? Answers will be sought based on the question. As a result of this hypothesis, this research was conducted to determine what kind of positive or negative awareness about kinesiophobia will occur in sedentary women as a result of Zumba exercises.

MATERIALS AND METHODS

In this section, explanations about the research model, research group, data collection tools, and data analysis are given.

Research Model

An experimental model was used in the study as a result of eight weeks of Zumba exercises. Experimental models are research models in which the data to be observed are produced under the direct control of the researcher to try to determine cause-and-effect relationships. In the non-experimental research model, the researcher does not make any intervention. The existing situation is examined within the scope of the research as it is (Sata, 2020). Dependent-independent variables to be examined in the research: Independent variables: Age, Job and educational status of sedentary women. Dependent variables: Zumba exercises The study group of this research consisted of a total of 40 sedentary women aged 18 and over. This group was specifically selected to increase the awareness of people who do not do sports about kinesiophobia, which is one of the

main objectives of our study, that is, injuries that occur during or after exercise. Convenient sampling method, one of the non-probability-based sample selection techniques, was used. The convenient sampling method involves the use of existing situations for the study to be conducted due to the limitations in terms of time, money and labor force (İlhan et al., 2016).Inclusion criteria; Volunteering for the research, -Being over 18 years old and female, Exclusion criteria; Presence of chronic diseases that prevent exercise (heart, diabetes, kidney disease, etc.), presence of musculoskeletal system diseases, Women with a body mass index outside the normal range, Ethics committee approval numbered 2023-42 was obtained from Non-Interventional Research Ethics Committee for this study. "Voluntary Consent Form" was signed by all participants in the study. All participants were warned that they could leave the study at any time of the study. The research was conducted in accordance with the principles stated in the Declaration of Helsinki. This study was carried out by the TUBITAK Scientist Support Programs Directorate (BİDEB) under the 2209-A Within the scope of the University Students Research Projects Support Program for the 2nd semester of 2022 Supported by the number 1919B012224904.

Subjects and Data Collection Tools

Personal Information Form

This form includes the variables of age, gender, marital status and educational status of the participants. Tampa Kinesiophobia Scale: In the study, the final version of the Tampa Kinesiophobia Scale, which was first created by Miller et al. in 1991 but not published and developed by Vlayen et al. in 1995 after obtaining the necessary approvals, and adapted into Turkish by Yılmaz et al. The scale is an evaluation form consisting of 17 questions and 4 different scores can be obtained for each question. According to the scores obtained from the questions asked in the scale, an individual can get a maximum score of 68 and a minimum score of 17. Here, the higher the score obtained in the general scoring, the more kinesiophobia the individual has. In addition, Zumba exercises were performed, sixty minutes a day/three days a week for eight weeks, Zumba Exercises: Zumba fitness, one of the fitness group exercises, is a new type of exercise that combines cardiovascular, Latin American dances and aerobic exercises with a high tempo, high energy, rhythm and music. As the 9th trend, Zumba, which has become the popular choreographed exercise of the agenda, manages to maintain interest by motivating participants with dance figures. The fact that Zumba sessions are not monotonous and the exercise is less formal than other group fitness programs has made Zumba popular. With the motto "Stop exercising and join the party", today 12 million people in 125 different countries in 110 thousand regions around the world practice Zumba. The research group will be choreographed 3 days a week for 60 minutes (including warm-up and cool-down) at an intensity of 50 - 60% of the target heart rate, accompanied by different dance music. This application will consist of 8-10 zumba music. Each music will last 3 to 5 minutes. Rest intervals will be 15-30 seconds. These activities will be practiced by İ.K., who has a Zumba coaching certificate.

Data Collection

Before the research, the participants were interviewed bilaterally, and a group of women who were sedentary was formed first. Individuals who exercise 60 minutes or less per week were considered sedentary. These participants were administered the kinesiophobia scale as a pre-test and then zumba exercises were performed for 8 weeks, 3 days a week and 60 minutes a day. At the end of eight weeks, the kinesiophobia scale was used again as a post-test and comparisons were made. The scale used in this study was applied to sedentary women who benefit from the sports facility and participate in zumba exercises in September 2023 and January 2024. The data of the subjects who voluntarily agreed to participate in the research, data were collected face to face and filled scale was recorded in the SPSS statistical program.

Statistical Analysis

IBM SPSS Statistics 26 software package (IBM Corp., Chicago, IL, USA) was used for statistical analysis. Normality distribution of the data were conducted using the Kolmogorov-Smirnov test. The homogeneity of variances was assessed using the Levene's test. The data were found to follow a normal distribution and parametric tests were applied. Descriptive statistics were reported as mean (M) and standard deviation (SD). Repeated Measures Anova test was used to analyze the Groups*Time interaction for the analysis of smoking, alcohol use, income and chronic disease status of the participants. The results of the ANOVA test were determined based on the Mauchly's Test of Sphericity. If Mauchly's Test of Sphericity yielded a value greater than 0.05, sphericity assumptions were considered met;

otherwise, the Greenhouse-Geisser correction was applied. Effect sizes were calculated using Cohen's d formula to determine the magnitude of the findings. The effect size for ANOVA was determined based on partial eta squared (η2p) values, with η2p values indicating the effect size as follows: η2p ≤ 0.01 indicating a small effect size, 0.01 ≤ η2p ≤ 0.06 indicating a medium effect size, and η2p ≥ 0.14 indicating a large effect size (Hopkins et al., 2009).In addition, a Paired Sample T-test was applied to analyze the 8-week kinesiophobia changes participants. The significance level was set at 0.05.

Table 1. Training program

Weeks	Training Name	Number Of Training (week)	Training Duration (minutes)	Resting Time	Heart rate interval (beats/min)		
					Low 120-140 beats/min	Medium 140-160 beats/min	High 160-180 beats/min
1. week	Compliance training	2-3	15-20	3-5 min/30 sec	*		
2.week		2-3	15-20	3-5 min/30 sec	*		
3. week		2-3	15-20	3-5 min/30 sec	*		
4. week		2-3	30-40	3-7 min/30 sec	*	*	
5. week	Zumba exercise program	3	30-40	3-7 min/30 sec	*	*	
6. week		3	30-40	3-7 min/30 sec	*	*	
7.week		3	50-60	3-10 min/30-60 sec	*	*	*
8.week		3	50-60	3-10 min/30-60 sec	*	*	*

*1st, 2nd and 3rd week of 8 weeks exercise duration = 20 min. Zumba exercise
*3rd, 4th and 5th week of 8 weeks exercise duration = 40 min. Zumba exercise
*7th and 8th week of 8 weeks exercise time = 60 min. Zumba exercise

RESULTS

The findings of our research are explained in the following tables in line with statistical analyzes.

Table 2. Demographic characteristics of the participants

Parameters	Mean ± S.D.
Age (year)	46.45±5.40
Weight (kg)	69.97±13.62
Height (cm)	162.90±5.52
BMI (kg/m^2)	26.41±5.24

Table 2 shows the demographic characteristics of the participants. The mean age of the participants was 46.45±5.40 years, the mean body weight was 69.97±13.62 kg, the mean height was 162.90±5.52 cm, and the mean BMI was 26.41±5.24 kg/m2.

In Table 3, the change in kinesiophobia level before and after the Zumba exercise was analyzed according to some parameters of the participants. The results indicate that the kinesiophobia levels of smokers, non-smokers and quitters did not change after zumba exercise [F (2, 17) =.832, η2p= .089, p=.452]. According to the participants' alcohol intake status, the kinesiophobia levels of alcohol users, never drinkers and quitters did not change after Zumba exercise [F (2, 17) =.221, η2p= .025, p=.804]. The kinesiophobia levels of the participants with and without chronic diseases did not change after zumba exercise [F (2, 17) =1.911, η2p= .096, p=.184]. According to the income status of the participants, the kinesiophobia levels of high, middle and low-income individuals did not change after zumba exercise [F (2, 17) =.132, η2p= .015, p=.878]

Table 3. Changes in kinesiophobia levels of participants

Parameters	Group	n	Pre-Test mean±S.D.	Post-Test mean±S.D.	F	η^2p	p
Smoking	Yes	13	37.85±5.31	38.85±6.23	.832	.089	.452
	No	5	43.60±5.45	39.80±2.38			
	Has Left	2	42.00±2.00	43.00±1.50			
Alcohol	Usually Yes	3	43.00±6.08	40.33±3.05	.221	.025	.804
	No	13	38.76±6.22	38.80±6.39			
	Has Left	4	39.25±3.30	40.25±2.98			
Chronic Disease	Yes	3	44.00±5.00	38.66±3.21	1.911	.096	.184
	No	17	38.70±5.55	39.41±5.72			
Income	High	5	38.00±3.39	36.40±7.79	.132	.015	.878
	Middle	11	39.92±6.52	40.28±4.35			
	Low	3	41.56±2.26	40.87±4.66			

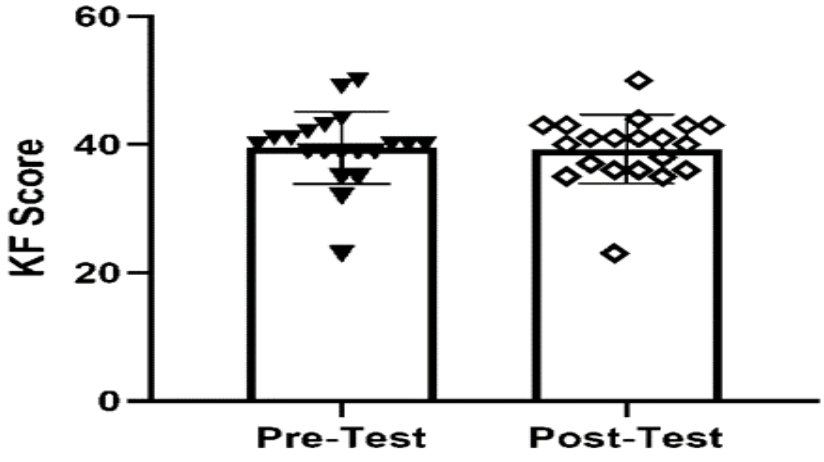

Figure 1. Investigation of kinesiophobia levels of participants

Figure 1 shows the kinesiophobia levels of the participants before and after the eight-week Zumba exercise program. Accordingly, there was no significant difference between the participants' kinesiophobia scores before the Zumba exercise (mean: 39.50±5.68) and after the exercise (mean: 39.30±5.36) (t=.125, p=.902).

DISCUSSION

This study aimed to examine the changes in kinesiophobia levels of sedentary women after eight weeks of the Zumba exercise program. To the authors' knowledge, no previous studies have investigated the effect of the Zumba exercise program on the changes in kinesiophobia levels in sedentary women. Therefore the effect of Zumba exercise on kinesiophobia levels of the sedentary women was not fully understood prior to this study. Previous studies have shown that regular physical activities differentiate individuals physiologically, mentally and psychologically (Perez & Greenwood-Robinson, 2009; Lavie et al., 2019). As for smoking parameters, the current study found that the kinesiophobia levels of smokers, non-smokers and quitters did not change after Zumba exercise. However, smoking users' kinesiophobia scores increased from 37.85 to 38.85. It can be concluded that smoking has a negative effect on kinesiophobia and since the score is between 33-42, it has moderate severity of kinesiophobia (Neblet et al., 2016).

In terms of participants' alcohol intake status, the kinesiophobia levels of alcohol users, never drinkers and quitters also did not change after the Zumba exercise program. While alcohol users tend to decrease kinesiophobia scores from 43.00 to 40.33 alcohol quitters tend to increase kinesiophobia scores. There is limited research on the relationship between alcohol use and kinesiophobia scores. However, individuals with alcohol addiction may have different kinesiophobia scores compared to those without addiction. In the current study, alcohol users have higher

kinesiophobia scores than non-alcohol users. It is important to note that kinesiophobia is a fear of movement or re-injury, and it is often associated with chronic pain conditions (Miller et al.,, 2020; Kandakurti et al., 2022).Alcohol use can also have negative effects on pain perception and pain management. Consequently, there may be a greater chance of developing kinesiophobia in people with chronic pain and alcohol consumption. To pinpoint the precise impact of alcohol use on kinesiophobia scores, more investigation is necessary.

Regarding chronic disease parameters, the kinesiophobia levels of the participants who had chronic diseases or not did not change after Zumba exercise [η2p= .096, p=.184]. Excessive fear of movement or exercise is known as kinesiophobia, and it can make people with chronic pain disabled (Denison et al.,, 2004). Self-efficacy, fear avoidance, and pain intensity as predictors of disability in subacute and chronic musculoskeletal pain patients in primary health care. Pain;111(3):245-252) There are several studies that investigate the relationship between kinesiophobia levels and chronic diseases (Denison et al.,, 2004; Koçyigit & Akaltu 2020) and chronic musculoskeletal pain (Bränström & Fahlström, 2008). These studies essentially indicate that kinesiophobia levels are linked to several clinical indicators in chronic diseases, including pain severity and subdomains of quality of life. Therefore, when screening individuals with chronic diseases, clinicians should pay particular attention to kinesiophobia and inform individuals about the condition's significance and treatment options.

In terms of the income status of the participants, the kinesiophobia levels of high, middle and low-income individuals also did not change after the Zumba exercise. We may conclude that participants who had higher income levels had lower kinesiophobia scores compared to the participants who had low-income levels. Given the positive correlation between anxiety and kinesiophobia, patients with better incomes tend to have lower levels of kinesiophobia (Wang et al., 2023).

Acknowledgement

The authors would like to thank all participants.

Conflict of Interest

There is no personal or financial conflict of interest within the scope of the study.

Information on Ethics Committee Permission

Ethics Committee approved the study protocol (Ethics committee approval numbered 2023-42).

Author Contributions

Conception and design of the study: AK, BÇ, İK; Data Collection: İK; Analysis and Interpretation of results: AK, BÇ; Draft manuscript preparation: AK, BÇ, BY; Final approval of the version to be published: AK, BÇ, İK, BY. All authors approved the final version of the manuscript.

DISCUSSION

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International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

Measurement of Physical and Mental Workload in Onlline Ojek Drivers: A Case Study in Serang City

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Abstract
The development of online motorcycle taxi transportation has received a good response in the community. With this application, it makes it easier for people to order motorcycle taxis more practically. Many online motorcycle taxi drivers have complaints while working, one of which is the obligation to meet life's necessities which causes the physical and mental workload to increase. This study aims to measure the physical and mental workload of online motorcycle taxi drivers in Serang City. Data collection was carried out by measuring heart rate with a Polar H10 and filling out the NASA-TLX questionnaire which was distributed to online motorcycle taxi drivers who were willing to be respondents. Data processing starts from measuring heart rate, with an average %CVL value obtained of 40.08%. This value is included in the physical workload category that requires improvement. Mental workload data, calculated through the NASA-TLX method, averaged 74.20, which is classified as high. To alleviate these workloads, it's suggested to incorporate 90-minute break periods, redesign automatic motorcycles with extra footrests, use energy sprays, implement road congestion detection tools, enhance the quality of ride-hailing apps, and minimize exposure to heat stress.

Keywords
Physical and Mental Workload, Heart Rate Variability (HRV), Cardiovascular Load (CVL), NASA-TLX, Borg Scale (CR-10)

INTRODUCTION

In the industrial era 4.0, there has been an increase in the use of online platforms. Digital technology and automation are used to increase efficiency and productivity in the production and manufacturing fields. Machines, systems and devices will collaborate automatically and compete with each other through Industry 4.0. In this industrial era, many companies can optimize production performance, improve product quality, and meet customer needs effectively (Asnawi, 2022). One of the startups that is growing rapidly in Indonesia is the online motorcycle taxi platform where this company makes the trend of ordering motorcycle taxis, delivering goods, delivering food, medicine and other things easier. Based on existing data, online transportation such as online motorcycle taxis, online taxi services, food delivery, and others will increase by 22% in 2022. The transaction value obtained is USD 77 billion (Annur, 2022). In 2014 there were 95,906 cases of motor vehicle accidents (Elwindra & Dokolamo, 2021). As many as 64% of these accidents occurred on motorcycles including online motorcycle taxi drivers.

The general characteristics of online motorcycle taxi drivers are time flexibility, dependence on technology, safety risks, freedom in income, physical fatigue, and high stress levels. Based on research that has been conducted, the characteristics of online motorcycle taxi drivers in Jakarta are gender, age, educational background, driving experience, working hours and income.

Received: 09 January 2024 ; **Revised** ; 22 February 2024 ; **Accepted:** 02 May 2024; **Published:** 25 May 2024

How to cite this article: Kusmasari, W., Mahirah, A., and Nalhadi, A. (2024). Measurement of Physical and Mental Workload in Onlline Ojek Drivers: A Case Study in Serang City. *Int J Disabil Sports Health Sci*;7(3):655-662.https://doi.org/10.33438/ijdshs.1409225

Interviews with 10 online motorcycle taxi drivers highlighted that their challenges include poor physical health, excessive drowsiness, body aches from prolonged sitting, and waist and shoulder pain during busy periods, leading to overall soreness. The need to provide for themselves and their families contributes to stress and mental strain. Other factors include the form of motorized vehicles, extreme weather, loads when there are passengers, and personal targets that must be achieved to meet life's needs, to the point of forgetting to rest, causing the physical condition to be more tired than usual.

The physical fatigue faced by online motorcycle taxi drivers can lead to severe accidents if not addressed promptly. Physical fatigue is caused by several factors including age, nutritional status, work period, workload, sleep time, and work duration (Belia & Handayani, 2018). According to data from Katadata Media Network, the number of traffic accident cases in the period January - 13 September 2022 is 94,600, this number continues to increase by 34.6% from the previous year (Kusnandar, 2022). Not only physical fatigue, mental fatigue is also one of the causes of human error where driver performance decreases when driving (Wahyuning, 2018).

Fatigue and drowsiness in drivers while driving are the main causes of road accidents (Rather et al., 2021). Fatigue can be classified into three main categories: active, passive, and sleep-related fatigue (May & Baldwin, 2009). Active fatigue is caused by strenuous work and the driver temporarily loses the ability to think. Passive fatigue is caused by tiring activities. Fatigue poses a significant risk in the transportation sector, particularly concerning driving performance, which must be addressed to prevent accidents involving tankers. However, previous studies have overlooked the examination of this issue within the oil and gas transportation sector (Nizam et al., 2020). This article suggests that driver distraction, such as cell phone use while driving, can increase the risk of a fatal crash or result in serious injury to teen drivers and their passengers. This study highlights the importance of awareness of driver distraction as a potential risk factor in traffic accidents (Neyens & Boyle, 2008). This article identifies several challenges in ADAS development and implementation, including difficulties in technology integration, system complexity, and the need for better standards. This article also reviews future trends in ADAS, such as the use of more advanced artificial intelligence, the development of more adaptive systems, and integration with autonomous vehicles. This research provides valuable insights for the automotive industry and researchers in developing more effective and safer ADAS in the future.

Several studies on motorcycle driver fatigue have been conducted. The results showed that the level of fatigue was found to be significant in both age categories (productive and adult age categories) (Muslim et al., 2015). In addition, in the adult age category, there is a significant influence between the level of fatigue and the level of concentration in motorcycle drivers. Most of the previous studies (83%) stated that riders perceived physical fatigue and postural discomfort as affecting performance and musculoskeletal symptoms (Ospina-Mateus & Quintana Jiménez, 2019). Several previous studies have not measured fatigue in online motorcycle drivers. This would be the novelty from this research.

Based on research conducted by Bramantyo and Pramono (2021), it is known that work in the external physical environment such as temperature, noise and lighting will be at risk of experiencing fatigue while working. In this research, it was found that there was an unsafe work environment, namely in the production section where the level of work fatigue that occurred was in the low to medium category. Where the results obtained 81.81% experienced mild levels of fatigue and 18.18% experienced moderate levels of fatigue on PT production floor work. Marabunta Works Ceperindo (Bramantyo & Pramono, 2021).

Based on the background above, this research was conducted to measure physical and mental workload problems in online motorcycle taxi drivers using the NASA-TLX measurement method and the Borg Scale. This aims to design a work system that effectively reduces the driver's level of physical and mental fatigue and increases their performance (Septiansyah et al., 2021). It's expected this research can help optimize the physical and mental health of online motorcycle taxi drivers.

MATERIALS AND METHODS

Research Model

The initial steps taken in the research were field observation and literature study. Field

observations were carried out directly to determine the physical and mental fatigue factors experienced by online motorcycle taxi drivers in Serang City. The observation location is located around SMPN 15 Serang City and under the McDonald's crossing bridge in Serang City. After the factors that cause fatigue at work were found, the next step was data collection for 10 online motorcycle taxi drivers. The data taken comes from heart rate when doing work and filling out the NASA-TLX questionnaire. The questionnaire contains data on measuring mental workload by giving a rating on a scale of 1-100 and a comparison between the two mental load indicators where the choice falls on the one that feels most dominant when working.

Data Collection Tools

Personal information form, personal interview, and mental data workload measurement questionnaire with NASA-TLX as data collection tools.

Personal Information Form

Participants were asked to fill in a 7-item personal information form about personal characteristics (age, cogniteal disease, smoking habit, exercise habit, caffein consumption, and food consumed).

After collecting data from heart rate and filling out the questionnaire, the next step is calculating heart rate using the Heart Rate Variability (HRV) method using Kubios software and Cardiovascular Load (CVL) to determine the percentage of perceived workload. To collect heart rate data, use the Polar Heart Rate (Polar H10) tool which is measured for 90 minutes while doing work. Physical workload was also assessed using the Borg Scale (CR-10) subjectively on the intensity of fatigue during physical activity. This scale is commonly used for exercise research, physical fitness testing, and other physical activity monitoring. The steps taken by researchers to obtain all research needs include conducting a literature study containing theories that support research in processing data. The theories used are obtained from books, references, research articles, news and other sources. Where this theory is related to the method used in this research, namely NASA-TLX and the Borg Scale method (CR-10). After the literature study is carried out, the next step is field observation of the object to be researched, namely online motorcycle taxi drivers who carry passengers, deliver goods and deliver food to obtain information about existing problems.

The data taken was a questionnaire distributed to 10 respondents during working hours. Data was obtained from online motorcycle taxi drivers who received orders from customers ordering trips or ordering food. The demographic data can be seen in Table 1. Online motorcycle taxi drivers smoke an average of 3 cigarettes per day. In addition, 60% consume caffeine. Exercise habit is 16 minutes per week.

Table 1. Training program

Weeks	Training Name	Number Of Training (week)	Training Duration (minutes)	Resting Time	Heart rate interval (beats/min)		
					Low 120-140 beats/min	Medium 140-160 beats/min	High 160-180 beats/min
1. week	Compliance training	2-3	15-20	3-5 min/30 sec	*		
2.week		2-3	15-20	3-5 min/30 sec	*		
3. week		2-3	15-20	3-5 min/30 sec	*		
4. week		2-3	30-40	3-7 min/30 sec	*	*	
5. week	Zumba exercise program	3	30-40	3-7 min/30 sec	*	*	
6. week		3	30-40	3-7 min/30 sec	*	*	
7.week		3	50-60	3-10 min/30-60 sec	*	*	*
8.week		3	50-60	3-10 min/30-60 sec	*	*	*

*1st, 2nd and 3rd week of 8 weeks exercise duration = 20 min. Zumba exercise
*3rd, 4th and 5th week of 8 weeks exercise duration = 40 min. Zumba exercise
***7th and 8th week of 8 weeks exercise time = 60 min. Zumba exercise**

RESULTS

Heart rate variability data was obtained from calculations using the Polar H10 device which was connected to the Polar Flow application. After the data is collected from using the Polar H10 tool, the data is then extracted into a CSV file which will produce a Microsoft Excel file output. Before being entered into the Kubios software, the existing file format is converted to text (MS-DOS). Table 2 is an example of a data processing graph for RMSSD, pNN50, LF, HF, and LF/HF from an online motorcycle taxi driver. The data included in the calculation above is an example from respondent 1. Starting from determining the maximum pulse rate obtained from subtracting the maximum pulse value for men and age with a result of 177 beats/minute.

Where respondent 1 is 43 years old with a working pulse of 114 bpm, and a resting pulse of 61 bpm, which produces a %CVL value of 45.7%. From all the calculations that have been done. The average CVL percentage obtained is 40.08%. Based on the average results obtained, this value falls into the category of requiring improvement, even though it is not urgent. This physical fatigue can be tested further using the NASA-TLX questionnaire by considering the mental workload experienced by the respondent for more precise results.

After the physical workload calculation is complete, the next calculation is mental workload using the NASA-TLX method. The six indicators used are mental demand (MD), physical demand (PD), temporal demand (TD), performance (OP), effort (EF), and frustration (FR). In this method the calculation starts with the aspect comparison value and ends with the category of value level obtained. After carrying out comparative calculations of 15 pairs of indicators, the next step is to calculate the product value.

Table 1. Score LF/HF

Variable	Units	VLF	LF	HF
Frequency band	(Hz)	0.00-0.04	0.04-0.15	0.15-0.40
Peak frequency	(Hz)	0.030	0.083	0.167
Power	(ms^2)	0	4	2
Power	(log)	0.000	1.379	0.824
Power	%	2.57	61.88	35.52
Power	(n.u.)		63.51	36.46
Total Power	(ms^2)	6		
Total Power	(log)	1.859		
LF/HF ratio		1.742		
RESP	(Hz)			

The product value is calculated by multiplying the weight and rating chosen by the respondent when filling out the questionnaire. After the weight and rating calculations are complete, the next step is to calculate the average WWL which aims to get a value for each mental workload indicator. Where the total product value is divided by 15. The calculation in Table 3 shows an example from respondent 1 where the total product value is 1170 categorized into the high load work group. The Borg scale is used to subjectively measure a person's level of perception during physical activity. The Borg Category Ratio (CR-10) scale is an improvement on the RPE scale where the rating used is 1 to 10. The assessment used for online motorcycle taxi drivers on this scale is before and after receiving an order. The resulting value is based on the question of how heavy the physical workload is experienced by the driver before doing the work and after doing the work. In all respondents it can be seen that there is an increase in the perception of fatigue (Figure 1).

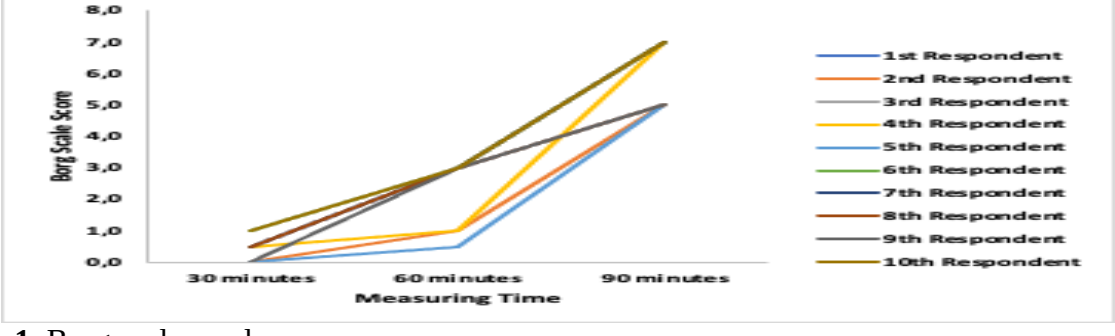

Figure 1. Borg scale resul

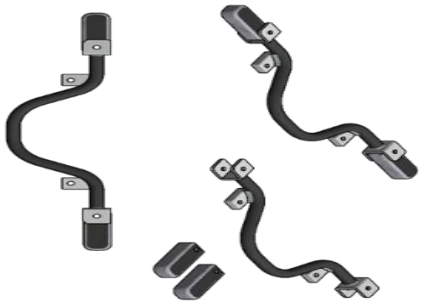

Figure 2. Extra footstep

Table 2. Recapitulation score WWL and finale score NASA-TLX

No	Dimensions	Respondent										Average
		1	2	3	4	5	6	7	8	9	10	
1	MD	320	70	360	0	120	225	150	165	150	135	
2	PD	200	320	300	240	195	340	340	340	255	340	
3	TD	90	400	360	220	180	60	140	160	120	70	
4	OP	90	240	0	240	0	255	240	130	225	130	
5	FR	200	0	300	65	180	70	170	80	65	40	
6	EF	270	160	100	210	85	240	140	240	320	280	
WWL (Rating X Weight)		1170	1190	1420	975	760	1190	1180	1115	1135	995	1113
Finale Score NASA-TLX		78	79,33	94,67	65,00	50,67	79,33	78,67	74,33	75,67	66,33	74,20

Tabel 3. Recapitulation rest time

Respondent	Rest Time (Minute)
1	5,79
2	6,23
3	12,79
4	17,31
5	28,69
6	18,42
7	39,88
8	12,38
9	9,73
10	11,52

Figure 3. Congestion detector prototype

DISCUSSION

Measurement Of Physical Workload

The output obtained from data processing using Kubios and Cardiovascular Load (CVL) software id that online motorcycle taxi drivers who were respondents in this study experienced physical fatigue. Heart rate while working greatly influences the value of the CVL percentage for each individual. If the heart rate is low, the physical fatigue experienced will also be low, conversely, if the heart rate is high, the physical fatigue experienced by online motorcycle taxi drivers will be higher (Klein et al., 2017).

In data processing, it was found that the average percentage of CVL was 42.02% with 9 respondents experiencing physical fatigue and 1 respondent not experiencing physical fatigue while working. The level of workload experienced by Grab riders in Mubarok (2023) used the CVL method with a CVL percentage result of 31% which shows that improvements are needed even though they are not urgent and there are proposals to reduce their physical workload, namely improving the quality of the Grab application, implementing time policies. maximum, and transparency for the driver (Rissa Hanny & Fahrizal, 2021).

Based on data processing using ratings from the Borg scale (CR-10), the level of physical fatigue experienced by 10 online motorcycle taxi drivers always increases. The resulting value is obtained through questions asked to respondents every 30 minutes. Online motorcycle taxi drivers who carry passengers and deliver food experience different levels of physical fatigue. Online motorcycle taxi drivers who carry passengers tend to be more tired because each passenger has a different weight and the distance traveled is uncertain. Meanwhile, the physical fatigue of online motorcycle taxi drivers carrying food is lower because of the waiting time which can be a temporary rest period while waiting for the ordered food to be ready.

Measurement Of Mental Workload

Heart Rate Variability (HRV) is used to objectively measure the mental workload experienced by each individual. From the processing of HRV data obtained using Kubios software, all respondents of online motorcycle taxi drivers who carry passengers and deliver food are in the range of values that are still reasonable for their mental fatigue. Based on research conducted by Guspriyadi et al (2014), the results of the average mental workload for respondents were the largest, namely 800.5 ms. The cause of fatigue occurs because the travel time on duty is 5 hours, carrying out duty at night, and being physically unfit leads to a decreased mental condition (Chadijah et al., 2019).

The study showed that workload and work stress variables have a partially significant negative effect on the performance of employees of online motorcycle taxi drivers (Grab, Maxim, and Gojek) in the Semarang City area (Purnomo & Waluyo, 2023). Results from other studies showed that workload has no significant effect on driver performance; commitment has a significant effect on driver performance; and workload and commitment have a significant effect on driver performance simultaneously (Hartono, 2023). This study concluded that factors that have a relationship with the work stress of online motorcycle taxi drivers are age, gender, marital status, and workload. While the interpersonal relationship variable has no relationship (Biella et al., 2023).

The mental fatigue experienced by online motorcycle taxi drivers who carry passengers (and deliver food is in the high category. The mental fatigue experienced is caused by the increasing number of competitors among online motorcycle taxi drivers with various cheaper platforms, the increase in the use of motorized vehicles by each individual, and the decreasing account rating which has resulted in a lack of customers for some people. This has a big impact on drivers' stress levels due to the demands they have to fulfill their individual life needs (Prabaswari et al., 2020).

This high mental fatigue score can also cause your physical condition to decline, because the lack of customers makes you feel weak and uninspired. Meanwhile, research conducted by (Hutabarat, et al (2023) on Gojek drivers in Surakarta City resulted in a mental workload score of 76.9 with the highest indicator value being the level of frustration caused by demands for fulfilling points, low number of incoming orders, and severe traffic jams. The results of this study and several previous studies show that mental workload is related to fatigue and performance of online motorcycle taxi drivers. Therefore, in addition to physical workload, mental also needs to be a concern for stakeholders.

Improvement Suggestions

Based on physical workload calculations using cardiovascular load (CVL), the results obtained were an average percentage of CVL of 42.02%. This percentage falls into the category of need for improvement, even though it is not urgent. And from the results of increasing the rating on the Borg scale (CR-10) fatigue. In order to reduce the level of physical workload experienced, there are improvement efforts for online motorcycle taxi drivers. The following are the proposed improvements:

Adding extra footstep for drivers who use automatic motorbikes which is useful for reducing leg fatigue as in Figure 2.

Calculate the total rest time while working. The following in Table 4 is an example of calculating rest time using a physiological approach (Handika et al., 2020).

Using sprayable energy discovered by a United States biochemist to reduce drowsiness (Siswanto & Tesavrita, 2015).

Based on research conducted on intercity bus drivers, a proposal to reduce mental workload is for companies to facilitate GPS or traffic jam detection devices (Maulana, 2019).

Conclusion

The physical fatigue that online motorcycle taxi drivers endure increases every 90 minutes as a result of several factors such as age, cigarette usage, weather, and the volume of incoming orders. The category of mental burden is high. Calculating working breaks, offering more steps to alleviate leg tiredness, enabling traffic-signal detecting devices, enhancing application quality, and minimising exposure to heat stress while at rest are some of the suggested enhancements. Additional investigation is required to develop a work structure that can reduce drivers' physical and mental load.

Funding

The author(s) received no financial support for the research. Industrial Engineering Department of Universitas Serang Raya

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethics Statement

This study is approved by the Universitas Serang Raya Ethics Committee (Approval Number: 02/KEPK/X/2023).

Author Contributions

Study Design, WK, AM, AN, Data Collection, AM; Statistical Analysis, AM and AN; Data Interpretation, AM and WK; Manuscript Preparation, WK, AM, AN; Literature Search, WK, AM, AN. All authors have read and agreed to the published version of the manuscript.

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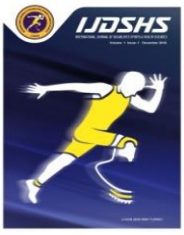

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

RESEARCH ARTICLE

The Effect of 12-Week Outward-Bound Training on Sports Attitude, Heart Rate and Physical Fitness Among College Students in China

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Abstract
Outward-bound training (OBT) originated in the UK as an outdoor survival method during World War II and is an experiential training course that emphasizes shaping teamwork, enhancing and strengthening individual psychological and athletic potential, and promoting organizational growth. However, OBT to improve sports attitude and physical fitness among college students remains unclear. The purpose of this study investigated the effect on sport attitude, heart rate and physical fitness among college students in China. Sixty college students (Aged 18-20, 19.05±0.85y) who were selected from Jiangxi Teachers College took part in this study. Participants were randomly assigned into two groups EG and CG. The EG completed 12 weeks OBT combined normal PE class intervention and the CG only for 12 weeks normal PE class intervention. The result indicated that the EG was statistically significant difference than control group after Paired-samples T test analysis for sports attitude questionnaire score (Male T=-11.515, P=0.001 and Female T=-23.070, P=0.001); HR_{Max} (Male T=-5.755, P=0.001 and Female T=-4.007, P=0.001); HR_{Avg} (Male T=-5.072, P=0.001 and Female T=-4.801, P=0.001); 50m run (Male T=8.085, P=0.001 and Female T=8.413, P=0.001); 800m run (Female T=5.949, P=0.001); 1000m run (Male T=3.722, P=0.001); Standing long jump (Male T=-2.233, P=0.042 and Female T=-5.824, P=0.001); Sit and reach (Male T=-3.872, P=0.002 and Female T=-5.274, P=0.001); Sit-up (Female T=-11.042, P=0.001); Pull-up (Male T=-4.276, P=0.001). Therefore, the conclusion suggested that 12-week OBT intervention was significant to improve sports attitude, heart rate and physical fitness among college students in China.

Keywords
Outward-Bound Training, Physical Education, “Health-First” Concept, College Students, Physical Fitness

INTRODUCTION

Modern school physical education originated from ancient Greece and Rome, the class system of Czech educator Comenius and developed into military physical education in Germany (Matlovičová & Matlovič, 2019). In the 16th to 20th centuries, sports education ideas in various countries around the world flourished, mainly represented by Rousseau's natural sports theory dominated by the United States and Dewey's empirical physical education teaching. The concept of physical education proposed by Chinese thinker, educator, and politician Yan Fu, as well as the sports labor and national defense system of socialist countries represented by the Soviet Union in the 20th century, and the lifelong sports education concept adapted to the development of capitalism…It can be said that the emergence and development of any type of school sports ideology cannot be separated from a strong sense of class and purpose. The above school sports ideology is established to achieve a certain purpose of the ruling class, and its content is to serve the ruling class (Yun et al., 2022).

In the late 20th century, the concept of “Health-first” physical education teaching in schools was first proposed based on the United Nations' advocacy of the concept of health for all mankind (An et al., 2022). In 1989, the latest

Received: 09 January 2024 ; **Revised** ; 18 February 2024 ; **Accepted:** 17 May 2024; **Published:** 25 May 2024

How to cite this article: Gao, J., Abdullah, B.B., and Dev, R.D.O. (2024). The Effect of 12-Week Outward-Bound Training on Sports Attitude, Heart Rate and Physical Fitness Among College Students in China. *Int J Disabil Sports Health Sci*;7(3):663-675.https://doi.org/10.33438/ijdshs.1417223

definition of the concept of health was: “Health is not only the absence of no diseases, but also includes body and mental health, social interaction and moral cultivation” (Smith et al., 2006). The connotation of the “Health first” physical education teaching concept and the concept of health are inseparable. Being a healthy person is not an easy task, because a truly healthy person also means being a fully developed person. This idea fully explains sports rights, puts people first, and aims for the physical and mental health of students. There is no class interest, so it is supported and recognized by the education community around the world. The concept of “Health first” has gradually formed during the development of PE and can be withstanded historical and practical tests.

At the beginning of the 21st century, in response to the spirit and call of UNESCO, the Yangzhou Conference on Physical Education in China established the guiding ideology of “Health first” as the guiding principle of physical education in Chinese schools (Zhou et al., 2022). Under the influence of this guiding ideology, the goals of physical education in China revolve around five fields: sports participation, skill learning, physical and mental health and social interaction. Specific explanations for learning objectives in five fields: (1) Sports participation objective: participating in sports learning and exercise, experiencing sports fun and success; (2) Skills learning objective: to learn sports knowledge, master sports skills and methods, and enhance awareness and prevention ability of safety and health; (3) Physical health objective: master health knowledge, shape body posture, comprehensively develop physical fitness; (4) Mental health objective: cultivate strong willpower and learn methods to regulate emotions; (5) Social adaptation objective: develop a sense of cooperation and ability, and possess good sports ethics (Liang & Hong, 2012). Therefore, in the new round education reform in China, the concept of “Health first” has been established and the “Physical Education and Health Curriculum Standards” have been issued at all levels of schools, which is enough to demonstrate the importance that Chinese college attaches to the concept of “Health first” physical education teaching.

However, due to various factors such as the national system, socio-economic development level, schools, families, and culture, research has found that according to the statistical results of student physical fitness standards provided by the national education and sports departments over the years, the teaching content is dull and boring, the teaching quality is not high, students' attitudes towards physical education learning are not positive, and students' participation in physical exercise is not high. The most important thing is that the endurance, muscle strength, and lung capacity of college students in the “Chinese National University and College Student Physical Health Standards Test” have been declining for more than 30 consecutive years, while their obesity and myopia are increasing year by year... This situation has seriously affected college students’ development and has become an urgent school sports problem to be solved (Wang, 2022), (O’Brien et al., 2022; Fan & Yu, 2017). These phenomena also directly indicate the problems in college physical education teaching activities in China. Of course, the reasons behind this phenomenon are diverse, complex, and deep-seated, including national systems, socio-economic development, school and family culture, and so on. Of course, in order to solve these problems, physical education teaching and teachers in Chinese universities have an unavoidable responsibility. It is still a long way to go to improve public physical education classes, make college students enjoy physical education classes, improve their physical fitness standards, and achieve the “health first” concept of physical education. Therefore, physical education teaching in universities urgently needs reform (Dong et al., 2023).

Outward-bound training (OBT) is an experiential teaching model proposed by Oxford University teacher Kurt Hahn in the 1930s. OBT originated in the UK. During World War II, the British seamen were attacked by Germany usually, and many sailors were buried at the bottom of the sea. As a result, it was found that the people who escaped were not necessarily physically strong, but they were people with strong willpower and a strong desire to survive. These people had rich survival experience and a spirit of teamwork. OBT refers to a training method in which students participate in outdoor activities, share experiences, reflect on behaviors, enhance awareness, hone willpower, improve personality, and refine teams under the guidance of trainers (Freeman, 2011). In 1941, Cohen trained young sailors and established the first Outward-bound school in the UK. In the 1970s, Massachusetts introduced OBT into school education and has now become an important

component of American school education. Singapore was the first to establish OBT schools, and since then, Hong Kong, Japan, and South Korea have introduced OBT and incorporated it into the school education system. In 1995, OBT teaching was introduced to the Chinese mainland for the first time. At present, OBT schools have been established in major cities such as Beijing and Shanghai. Tsinghua University is the first to introduce OBT into the MBA teaching system (Guanghong, 2017). So far, the teaching concept and methods of OBT have not been widely implemented and applied in college physical education teaching. How to apply OBT to college has become a hot topic in the reform of college physical teaching in China (Mees et al., 2022).

This article verified whether outward bound training (OBT) has a significant impact on the improvement of attitude, heart rate and physical fitness by conducting a 12 weeks intervention among university public sport students in Jiangxi Teachers College, China. To provide theoretical supplements for the specialized outward-bound training (OBT) for public physical education, as well as feasible references for development of college public physical education in China.

MATERIALS AND METHODS

Participants

60 college male and female public sport students were selected from Jiangxi Teachers College took part in this study, (Aged 18-20, 19.00±0.87year, Height: 172.06±5.93cm, Weight: 70.66±7.51 kg) for male students, (Aged 18-20, 19.10±0.84year, Height: 159.00±5.69 cm, Weight: 49.40±8.06 kg) for female students. Those subjects were randomly and reasonably divided into two groups, a control group and an experimental group. In two different groups, each group has 30 students (including 15 male and 15 female). Inclusion criteria in this study: (1) Physically and mentally healthy; (2) Without any illness; (3) No history of body injury within the past month; (4) Freshman from social and natural sciences department or major (non-sports major students); (5) Not trained in the outward-bound training (OBT) systematically; (6) Be able to complete physical fitness tests and actively cooperated with this OBT experimental study. As shown in Table 1.

Table 1. Sample Characteristics (N = 60)

Characteristics	Mean (Standard Deviation)	
	Male students	Female students
Number	30	30
Age (year)	19.00±0.87	19.10±0.84
Height (cm)	172.06±5.93	159.00±5.69
Weight (kg)	70.66±7.51	49.40±8.06

Procedure

Selection of training events content

OBT can be divided into field training events, outdoor training events, and water training events (Zang, 2023). This study excluded some dangerous and difficult events to carry out and time-consuming events when confirming training events content, and selected some events that can be carried out in public physical education classrooms in universities These OBT events are easy to operate, have a short training time, and do not require high physical fitness for students, ensuring the smooth progress of experimental research. In order to improve students' physical fitness standards and the quality of public physical education teaching, this article introduces 12 outdoor expansion training projects in the experimental group students' public physical education class: (1)Rolling wheels, (2)Arbitrary back falls, (3) Fetching water in thorns, (4)Bravely breaking through thunderstorms, (5)Drilling the power grid, (6)Hitting drums and bouncing balls, (7)Two people and three feet, (8)Extreme speed of 60 seconds, (9)Mobile ladders, (10)Joint construction, (11)Traveling thousands of miles in pearls, (12) 100m Orienteering sports. As shown in Figure 1a,b.

Figure 1a. The 12 activities for OBT intervention

Figure 1b. The 12 activities for OBT intervention

Determine the relationship between introduced OBT events and public PE classes

According to classroom routines, time allocation, and student activity and skill mastery in China, a public physical education class is generally divided into 4 parts in 90 minutes: start part, preparation part, basic part and end part (Wei & Liu, 2018). The start part is usually a class routine with a duration of 3-5 minutes, which is not suitable for outdoor expansion training. The preparation part is usually a student warm-up activity, which lasts for 15-20 minutes. In order to increase students' attention and interest in participating in physical education classes, some OBT events can be introduced in this part. The basic part is the core part of physical education class, which lasts for the longest time, about 50 minutes. This part is also a key for students to learn sports skills and knowledge, practice and deepen their mastery. This part also can introduce some OBT events, but it should be noted that it does not affect the learning of college teaching content, the aim is to help students learn skills and enhance their participation and interest. The end section is a stage where students relax and teachers summarize, with a time of about 15 minutes, which can be suitable for carrying out some OBT events too.

Time allocation for OBT events

This study strictly controlled the time of each OBT event, and improved 12 selected OBT events while ensuring the normal development of various links in public physical education classes in universities. For example, the OBT events introduced into the preparation part were controlled at about 15 minutes, and the OBT events introduced into the basic section were controlled at about 20 minutes, the OBT events that will be introduced to the end part will be limited to around 10 minutes. This kind of time allocation and improvement is very necessary. On the one hand, it increases students' interest in participating, it also ensures the normal development and progress of public physical education teaching content, because the purpose of this study is very clear: public physical education classes in universities are primary, while OBT events are secondary. OBT events are a part and play an auxiliary role in public physical education classes.

In all, in this article, there is a 12-week outward-bound training (OBT) period and it was divided into two training stages according to difficult OBT events. The experimental group conducted a 12-week experiment for outward-bound training (OBT) intervention plus normal public physical education teaching activity, while the control group conducted 12 weeks normal public physical education teaching activity only. Experimental group trained 1 time/week for public physical education teaching activity and each training time lasted about 10-20 min for different parts of the public physical education class. The first stage is week 1-6, and the second stage is week 7-12. Before the intervention, there was pre-test, post-test was after 12th week for both of the two groups for all dependent variables (sports attitude, heart rate and physical fitness) of all the subjects. The differences in test indicators between the two groups were analyzed and compared. The stage and experimental intervention content is shown in Table 2.

Test protocol

By consulting relevant literature and books for physical education, interviewing 6 experts who have been worked for college sports and education in different university and college in China, and based on the "Chinese National University and College Student Physical Health Standards", it was ultimately determined that the attitude, heart rate and physical fitness test of the subjects of this experiment is reflected in the evaluation OBT on sports attitude, heart rate and physical fitness among college students in China.

This article selected the 3 indexes attitude, heart rate and physical fitness of testing indicators for this experiment. The test indicators and indexes for dependent variables content is shown in Table 3.

Table 2 The stage and content of experimental intervention

Stage	Duration & Frequency	Experimental intervention in two gorups		Repetition (only for EG)	Sets (only for EG)	Recovery (only for EG)
		EG/(OBT)	CG			
Week 1-6	1 Times / Week 10-20 min for OBT only	1. “Rolling wheels” combined Normal PE activity	1.Normal PE activity	1-3	1-2	2min
		2. “Traveling thousands of miles in pearls” combined Normal PE activity	2.Normal PE activity	1-3	1-2	
		3. “Hitting drums and bouncing balls” combined Normal PE activity	3.Normal PE activity	1-5	1-2	
		4. “Drilling the power grid” combined Normal PE activity	4.Normal PE activity	1-5	1-2	
		5. “Bravely breaking through thunderstorms” combined Normal PE activity	5.Normal PE activity	1-5	1-2	
		6. “100m Orienteering sports” combined Normal PE activity	6.Normal PE activity	1	1	
Week 7-12	1 Times / Week 10-20 min for OBT only	7. “Extreme speed of 60 seconds” combined Normal PE activity	7.Normal PE activity	1-3	1-2	
		8. “Arbitrary back falls” combined Normal PE activity	8.Normal PE activity	1-5	1-2	
		9. “Fetching water in thorns” combined Normal PE activity	9.Normal PE activity	1-3	1-2	
		10. “Joint construction” combined Normal PE activity	10.Normal PE activity	1-3	1-2	
		11. “Two people and three feet” combined Normal PE activity	11.Normal PE activity	1-5	1-2	
		12. “Mobile ladders” combined Normal PE activity	12.Normal PE activity	1	1	

Table 3. The test indicators and indexes

Test Variables	Test indexes	Instruments/measured tandards
Attitude (score)	Attitude survey questionnaire (Banville et al., 2021)	Reliability-Intraclass Correlation Coefficient (ICC) is 0.90; Validity: 0.95
	HR HR_{Max} HR_{Avg}	Mobile BENKEN intelligent heart rate detection watch
Physical fitness	50m run, 800m run, standing long jump, sit and reach, sit-up (female), pull-up(male)	“Chinese National University and College Student Physical Health Standards Test Scale, 2023”

Instruments and scale

The attitude survey questionnaire (Banville et al., 2021) (which have a high reliability 0.90 and validity 0.95) was selected for student's attitude testing of college sports education for Jiangxi Teachers college students. The BENKEN intelligent heart rate detection watch produced by Huawei company in China, 2022 was selected for student's average/max heart rate testing in public PE class. Physical fitness of 50m run, 800m run, standing long jump, sit and reach, sit-up (female), pull-up (male) was measured by "Chinese National University and College Student Physical Health Standards Test Scale 2023". Furthermore, new height and weight meters, 400-meter standard track and field, standing long jump tester, sit up tester, sit and reach tester, pull-up tester were selected for anthropometric parameters and physical fitness test (Hu, 2022). As shown in Figure 2.

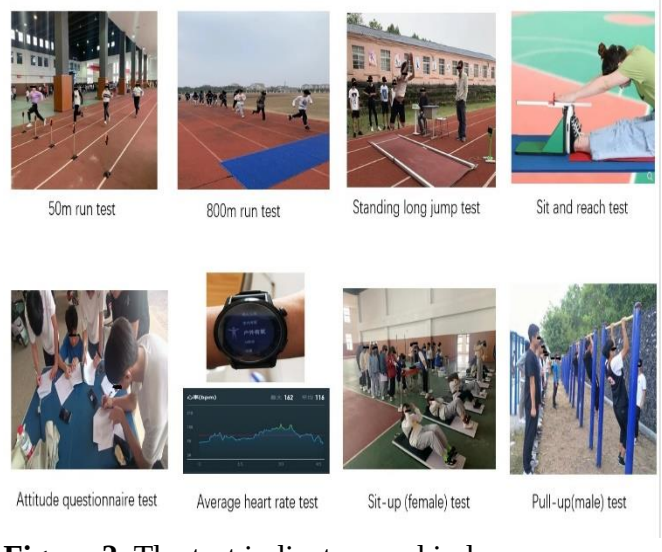

Figure 2. The test indicators and indexes

Data collection

In this study, the index of all dependent variables (Attitude, Average heart rate and Physical fitness) testing indicators for this experiment were measured. In addition, the tester recorded the result of Questionnaire (score), Average/Max heart rate (BPM) in PE class with 4 parts (start, warm, main and relax) 90 min class, Physical fitness with 50m run, 800m run, standing long jump, sit and reach, sit-up (female), pull-up(male) for public college students of EG and the CG respectively for pre and post-test.

Statistical analysis

Results were analyzed both descriptive and inferential Statistics. Descriptively, the mean (M) and standard deviation (SD) were used, as well as the frequency of values and their corresponding percentage. Inductively, the Paired-samples T test was used for analysis of mean different all dependent variables between the study group and the control group, separately, pre-test and post-test. In addition, after each group was isolated, Levene's test of equality of variances was performed to find differences between the pre-test and post-test. The normality of the data was checked using Kolmogorov-Smirnov and Shapiro-Wilk's test ($p>0.05$) IBM SPSS 28 was used to perform the statistical analysis and the significance level was set at 0.05.

RESULTS

In table 4 and 5, the result showed the result for Paired-samples T test for Attitude, Average/Max heart rate and Physical fitness. According the T test, the mean of post-test value of experimental group was statistically significant difference than pre-test value for Questionnaire score (Male T=-11.515, P=0.001 and Female T=-23.070, P=0.001); HRMax (Male T=-5.755, P=0.001 and Female T=-4.007, P=0.001); HRAvg (Male T=-5.072, P=0.001 and Female T=-4.801, P=0.001); 50m run (Male T=8.085, P=0.001 and Female T=8.413, P=0.001); 800m run (Female T=5.949, P=0.001); 1000m run (Male T=3.722, P=0.001); Standing long jump (Male T=-2.233, P=0.042 and Female T=-5.824, P=0.001); Sit and reach (Male T=-3.872, P=0.002 and Female T=-5.274, P=0.001); Sit-up (Female T=-11.042, P=0.001); Pull-up (Male T=-4.276, P=0.001).

Also the results showed that the mean of post-test value of CG was no significant difference than pre-test value (except 50m run (Female), P=0.011) for Questionnaire score (Male T=-1.221, P=0.242 and Female T=-0.417, P=0.683); HRMax (Male T=1.279, P=0.222 and Female T=-1.538, P=0.146); HRAvg (Male T=-0.585, P=0.568 and Female T=0.786, P=0.445); 50m run (Male T=-0.242, P=0.812 and Female T=2.922, P=0.011); 800m run (Female T=-0.736, P=0.474); 1000m run (Male T=-1.240, P=0.235); Standing long jump (Male T=0.489, P=0.626 and Female T=-1.075, P=0.301); Sit and reach (Male T=-2.046, P=0.060 and Female T=-0.854, P=0.408); Sit-up (Female T=0.099, P=0.923); Pull-up (Male T=-0.367, P=0.719). As shown in Table 4 and 5.

Table 4 The Results analysis of paired-samples T test for post-test of EG

Variables	Test item	EG		T Value	P Value Two-sided
		Pre-test	Post-test		
Sports attitude	Questionnaire score (Male)	33.20±5.93	43.47±4.53	-11.515	0.001*
	Questionnaire score (Female)	33.93±4.83	43.86±4.17	-23.070	0.001*
Heart rate	HRMax (BPM) (Male)	168.53±9.66	185.60±6.48	-5.755	0.001*
	HRMax (BPM) (Female)	157.27±8.61	167.07±5.93	-4.007	0.001*
	HRAvg (BPM) (Male)	133.93±9.74	150.73±7.27	-5.072	0.001*
	HRAvg (BPM) (Female)	129.07±10.27	144.87±6.70	-4.801	0.001*
Physical fitness	50m run (s) (Male)	8.01±0.31	7.16±0.36	8.085	0.001*
	50m run (s) (Female)	9.97±0.21	9.14±0.33	8.413	0.001*
	1000m run (s) (Male)	210.20±3.41	200.33±10.2	3.722	0.001*
	800m run (s) (Female)	234.07±5.95	222.33±9.74	5.949	0.001*
	Standing long jump (cm) (Male)	237±7.00	244±10.00	-2.233	0.042*
	Standing long jump (cm) (Female)	184±13.00	202±12.00	-5.824	0.001*
	Sit and reach (cm) (Male)	14.33±8.03	24.07±6.04	-3.872	0.002*
	Sit and reach (cm) (Female)	20.53±14.17	29.07±10.11	-5.274	0.001*
	Sit-up (time/min) (Female)	28.60±7.43	34.60±8.35	-11.042	0.001*
	Pull-up (time) (Male)	6.27±1.91	8.20±1.66	-4.276	0.001*

* P < 0.05 means significant differences

Table 5 The Results analysis of paired-samples T test for post-test of CG

Variables	Test item	CG		T Value	P Value Two-sided
		Pre-test	Post-test		
Sport attitude	Questionnaire score (Male)	32.73±4.56	33.60±4.27	-1.221	0.242
	Questionnaire score (Female)	33.66±3.94	33.86±4.29	-0.417	0.683
Heart rate	HRMax (BPM) (Male)	171.67±9.74	168.47±9.20	1.279	0.222
	HRMax (BPM) (Female)	160.87±8.40	157.73±8.43	1.538	0.146
	HRAvg (BPM) (Male)	128.40±26.8	132.80±8.34	-0.585	0.568
	HRAvg (BPM) (Female)	131.07±9.12	128.93±9.79	0.786	0.445
Physical fitness	50m run (s) (Male)	8.05±0.41	8.08±0.34	-0.242	0.812
	50m run (s) (Female)	10.17±0.33	9.93±0.19	2.922	0.011*
	1000m run (s) (Male)	208.73±3.58	209.67±4.60	-1.240	0.235
	800m run (s) (Female)	232.93±4.93	234.53±8.13	-0.736	0.474
	Standing long jump (cm) (Male)	238±9.00	237±7.00	0.489	0.626
	Standing long jump (cm) (Female)	187±10.00	190±9.00	-1.075	0.301
	Sit and reach (cm) (Male)	14.77±6.85	18.27±4.59	-2.046	0.060
	Sit and reach (cm) (Female)	18.93±3.86	20.40±4.58	-0.854	0.408
	Sit-up (time/min) (Female)	29.27±4.65	29.07±5.57	0.099	0.923
	Pull-up (time) (Male)	6.13±2.45	6.33±2.09	-0.367	0.719

* P < 0.05 means significant differences

Summary of the data analysis results, as consequence, data analysis for independent-samples T test showed that there was a significant effect of experimental group than control group on Attitude, Average/Max heart rate and Physical fitness as the dependent variables testing indicators for this experiment in pre-test and post-test among public physical education students in China.

In EG, the mean and standard deviation of questionnaire score (Male: pre-test=33.20±5.93, post-test=43.47±4.53; Female: pre-test=33.20±5.93, post-test=43.47±4.53); HRMax (Male: pre-test=168.53±9.66, post-

test=185.60±6.48; Female: pre-test=157.27±8.61, post-test=167.07±5.93); HRAvg(Male: pre-test=133.93±9.74, post-test=150.73±7.27; Female: pre-test=129.07±10.27, post-test=144.87±6.70); 50m run (Male: pre-test=8.01±0.31, post-test=7.16±0.36; Female: pre-test=9.97±0.21, post-test=9.14±0.33); 800/1000m run (Male: pre-test=210.20±3.41, post-test=200.33±10.2; Female: pre-test=234.07±5.95, post-test=222.33±9.74); Standing long jump (Male: pre-test=237±7.00, post-test=244±10.00; Female: pre-test=184±13.00, post-test=202±12.00); Sit and reach (Male: pre-test=14.33±8.03, post-test=24.07±6.04; Female: pre-test=20.53±14.17, post-test=29.07±10.11); Sit-up and Pull-up (Male: pre-test=6.27±1.91, post-test=8.20±1.66; Female: pre-test=28.60±7.43, post-test=34.60±8.35).

In CG, the mean and standard deviation of questionnaire score (Male: pre-test=32.73±4.56, post-test=33.60±4.27; Female: pre-test=33.66±3.94, post-test=33.86±4.29); HRMax (Male: pre-test=171.67±9.74, post-test=168.47±9.20; Female: pre-test=160.87±8.40, post-test=157.73±8.43); HRAvg(Male: pre-test=128.40±26.8, post-test=132.80±8.34; Female: pre-test=131.07±9.12, post-test=128.93±9.79); 50m run (Male: pre-test=8.05±0.41, post-test=8.08±0.34; Female: pre-test=10.17±0.33, post-test=9.93±0.19); 800/1000m run (Male: pre-test=208.73±3.58, post-test=209.67±4.60; Female: pre-test=232.93±4.93, post-test=234.53±8.13); Standing long jump (Male: pre-test=238±9.00, post-test=237±7.00; Female: pre-test=187±10.00, post-test=190±9.00); Sit and reach (Male: pre-test=14.77±6.85, post-test=18.27±4.59; Female: pre-test=18.93±3.86, post-test=20.40±4.58); Sit-up and Pull-up (Male: pre-test=6.13±2.45, post-test=6.33±2.09; Female: pre-test=29.27±4.65, post-test=29.07±5.57). As shown in Figure 3-7.

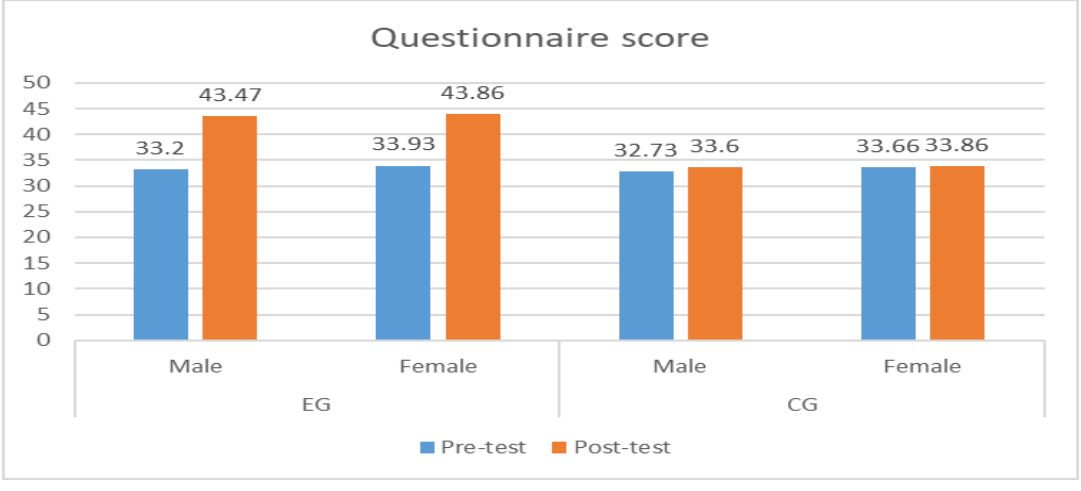

Figure 3. Mean of questionnaire score among all groups in tests times

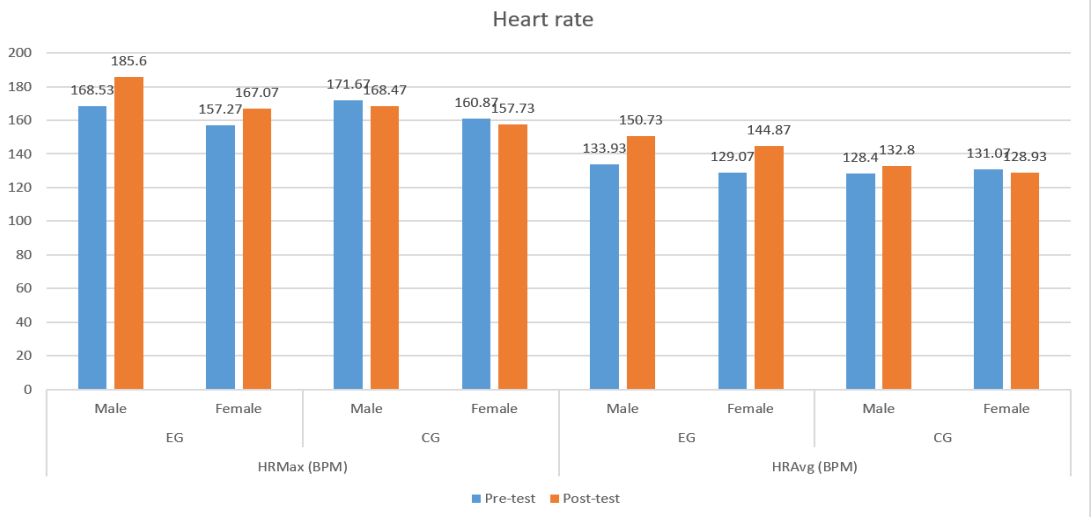

Figure 4. Mean of heart rate among all groups in tests times

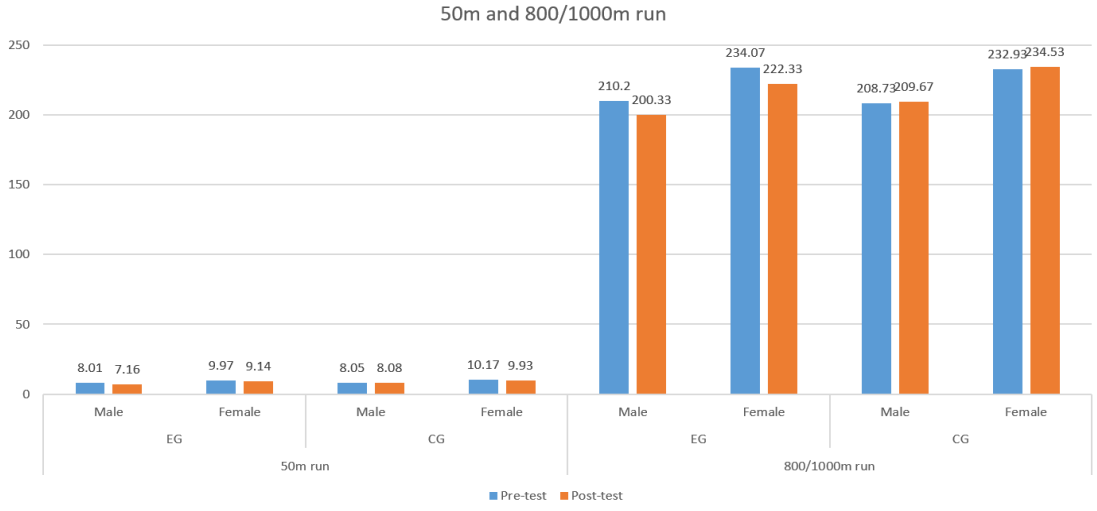

Figure 5. Mean of 50m and 800/1000m run among all groups in tests times

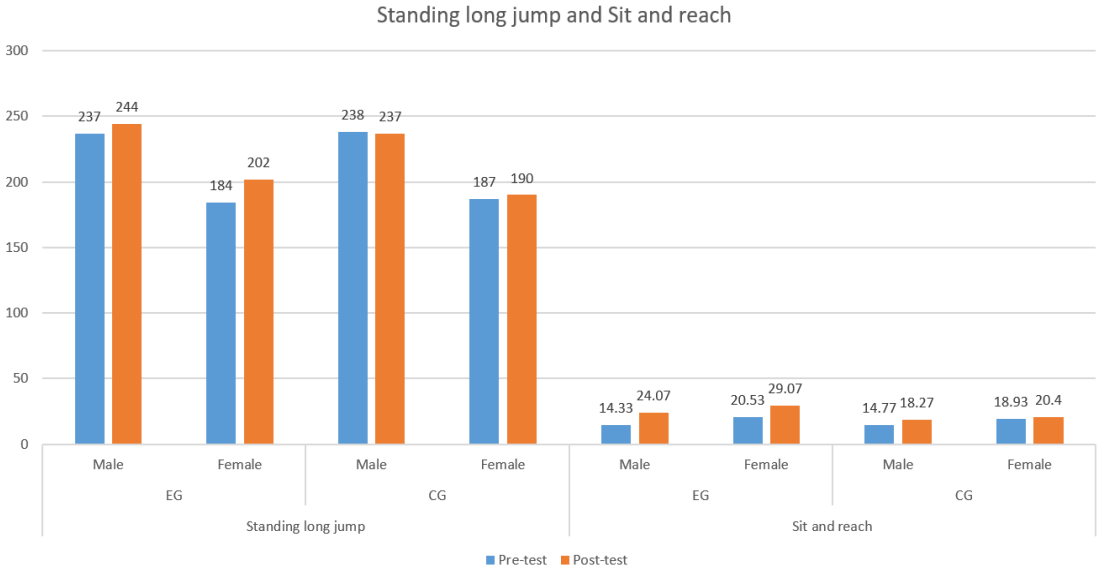

Figure 6. Mean of standing long jump and sit and reach among all groups in tests times

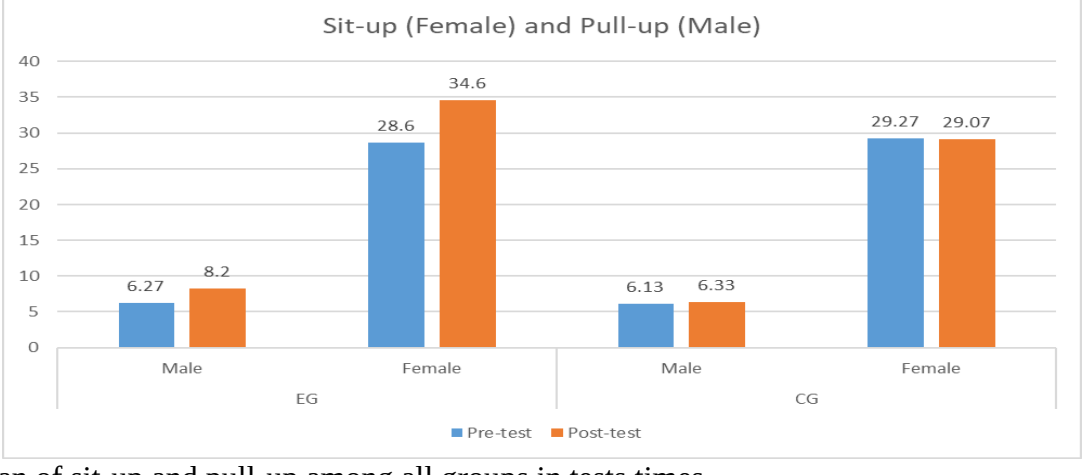

Figure 7. Mean of sit-up and pull-up among all groups in tests times

DISCUSSION

Effects of OBTon sports attitude for college students

In this study, after introducing outdoor expansion training into public physical education classes, through 12 weeks of teaching experiments and survey questionnaires, it was found that the public physical education students in the experimental group showed a significant increase in their interest in physical education classes compared to CG. This indicates that introducing OBT into public physical education teaching activities in universities has a significant effect interest and enthusiasm in physical education classes. In addition, this article found through a survey questionnaire and interviews with experimental group students that they are very interested in the content of outdoor expansion training. Some students are very eager to attend public physical education classes and also strongly agree to introduce more outdoor expansion training content into public physical education. OBT involves the addition of new training content, allowing students to work together to complete tasks and goals, and share the joy of physical education classes. Therefore, through the introduction of outdoor expansion training, public PE class have become increasingly popular among students, and their interest in public PE class courses has significantly increased.

The reason for this is as follows: Firstly, the OBT events are novel. The OBT events selected by the experimental research institute are traditional public physical education courses such as track and field, basketball, football, volleyball, etc., which are basically not carried out in university public physical education classes. These training programs break free from the boring and tasteless physical and ball training content of regular public physical education classes, and the fresh training content attracts students' participation and interest improvement. Secondly, the value of students' physical exercise is reflected. Most of these OBT events require team cooperation to complete, and each student in the team plays an important role. Therefore, it is necessary to require team cooperation and decision-making to solve problems and complete the training. The value of each student's physical exercise can be reflected, making students feel valued, so that they are willing to participate in it, and their interest in learning physical education naturally increases. Thirdly, innovation in physical education teaching methods (Yang et al., 2023).

Effects of OBT on heart rate for college students

The participation of students in sports classes is an important indicator reflecting the effectiveness of public physical education teaching (Guo et al., 2023). The participation of students in public physical education classes can be evaluated from two aspects: one is physiological heart rate indicators, and the other is qualitative analysis, which is to observe the actual activities of students in public physical education. In this study, through a 12-week OBT public physical education teaching experiment, it was found that after introducing OBT in public physical education classes, the HRMax and HRAvg of students in the experimental group in physical education classes were significantly higher than those in the control group, and their participation in public physical education classes was significantly improved. The increase in the average and maximum heart rates of students in public physical education classes can be explained as a direct result of outdoor expansion training intervention. It can be said that the introduction of OBT has played a major role in improving the participation of students in public physical education classes.

The reasons for this are as follows: Heart rate is an important indicator reflecting the intensity of human exercise (Herbert et al., 2020). According to the training intensity of students in public physical education classes, there are 3 level for the relationship between HRAvg and intensity, 120<HRAvg <140 beats per minute, low intensity;140< HRAvg <160 beats per minute, Moderate intensity; HRAvg >160 beats per minute, high intensity (Kim et al., 2022). It can be found that before the experiment, the students' HRAvg were in the range of 120<HRAvg<140 beats per minute in experimental group and control group, which belongs to low intensity. After the experiment, the average heart rate of male students in the experimental group was 150.73 ± 7.27, and that of female students was 144.87 ± 6.70, both reaching over 140 beats per minute, reaching moderate intensity. In addition, with the development of science and technology, wearable devices for detecting heart rate have been widely used in sports training, physical education teaching, and other aspects. If analyzing the improvement of outdoor expansion training in public physical education

students' participation from the perspective of learning attitude and interest is not very comprehensive, then explaining this issue from the perspective of heart rate and data has strong persuasiveness. Wearable devices can constantly detect the state of students' participation in public physical education classes, and the changes in students' heart rate during public physical education classes can reflect their participation in activities.

Effects of OBT on physical fitness for college students

The data of "Chinese National University and College Student Physical Health Standards Test" can directly reflect the quality of public physical education teaching in a university, because students' physical fitness is an external manifestation of physical health, and physical health is an important component of health, which is an important prerequisite for ensuring students' health. Without a good body, there is no way to engage in other teaching and social activities. In this study, after conducting a 12-week OBT experiment, it was found that the physical fitness of college students in the experimental class significantly improved compared to the control group in indicators such as 50m run, 800m run, standing long jump, sit and reach, sit up (female), pull up (male), etc. This directly demonstrates the important impact of introducing OBT on the effectiveness of public physical education teaching in universities

The reason for this is as follows: Physical fitness is a comprehensive reflection of the functions of various organ systems in the human body during muscle work, and is a general term for the strength, endurance, speed, flexibility, sensitivity, and coordination exhibited in sports (Kljajević et al., 2022). Physical fitness is not only influenced by genetic factors, but is largely determined by acquired sports methods, exercise load, selection of exercise content, and exercise habits. The different events of OBT have targeted exercise effects on developing students' general strength, reaction speed, explosive power, endurance, and balance in public physical education classes. For example, the event of Fetching water in thorns for OBT has a good effect on the development of strength and flexibility qualities in college public PE students, while some of these events have a significant improvement effect on balance and agility qualities, but have little effect on strength and endurance qualities; For example, again, 100m Orienteering sports have a very good exercise and improvement effect on the endurance and speed of college students... Therefore, long-term and reasonable arrangement of OBT events that meet the physical and mental development characteristics of students can effectively and comprehensively improve the physical fitness and health level of public PE students.

Conclusions

The experimental group received significant training on sport attitude, heart rate and physical fitness of college students. The OBT compared to normal PE class teaching activities, indicated that OBT has a significant effect on public PE students' attitudes, participation, and effectiveness towards public physical education classes. This study started from the perspective of experiential teaching, drew on the theories of education, psychology, and school sports, and studied the application of outdoor expansion training in public sports in universities. It revealed the problems in public sports teaching in universities and provides research cases for the introduction of teaching methods in public sports in universities, It has important theoretical and practical significance for effectively promoting the reform of public physical education teaching in universities and improving the quality of public physical education teaching.

Introducing the OBT into the teaching of public physical education courses in universities, firstly, has increased public PE students' interest and enthusiasm in public physical education courses, and further enhanced their participation in public physical education courses; Secondly, through OBT, public PE students' willpower and teamwork awareness have been enhanced; Thirdly, it helps public PE students to master various techniques and knowledge of public physical education to a certain extent, and improves their physical fitness significantly. Finally, it has promoted the reform of public physical education teaching and improved the quality of public physical education teaching in universities.

OBT is an experiential training course that emphasizes shaping team cooperation, enhancing and strengthening individual psychological qualities and sports potential, and promoting organizational growth. The content of OBT plays an important role in enhancing the interest and enthusiasm of students in public physical education classes in Chinese universities, cultivating students' lifelong sports concepts and social adaptability, and improving the effectiveness of public physical

education teaching in universities. Therefore, this study focused on the application of "experiential teaching" in public physical education classes in Jiangxi Teachers College, China, introduced outdoor expansion training into the teaching of public physical education classes in universities, stimulated the interest and enthusiasm of college students in public physical education classes, increased their participation in physical education classes, and achieved the goal of improving the quality of public physical education teaching, promoted students' physical fitness standards, and improved their psychological and social adaptability.

ACKNOWLEDMENT

We declare that there is no conflict of interest between the authors.

Funding

This research was financially supported by the Teaching Reform Research Project of Jiangxi Provincial Department of Education in China (Grant NO. JXJG-17-47-6).

Conflict of Interest

There is no personal or financial conflict of interest within the scope of the study.

Information on Ethics Committee Permission

Ethics Committee approved the study protocol (Ethics committee approval numbered 03.11.2023).

Author Contributions

Conception and design of the study: JG, BBA and RDOD; Data Collection: JG and RDOD; Analysis and Interpretation of results: JG, BBA and RDOD; Draft manuscript preparation: JG and BBA; Final approval of the version to be published: JG, BBA and RDOD. All authors approved the final version of the manuscript.

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International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

Measuring Social Behavior According to the Psychology of Bilateral Relationships and its Relationship to Gender and Geographical Location for University Students Applying 2022-2023

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Abstract
Activation of all social roles that university student must show during stage of university application in middle and high schools, so research problem is that achieving sufficient studies in field of social behavior does not reach level that students of physical education and sports science . Research aim Building, legalizing and applying a measure of components of social behavior (his behavior with himself, his behavior with his supervisor's teacher, his behavior with school administration, his behavior within his students inside lesson) according to (bilateral relations) for students applied in middle schools. research community is one of students and students of fourth stage in Faculty of Physical Education and Sports Sciences, Basra University for academic year 2022- 2023, which number (236) of morning and evening studies. As for research sample, it reached (180) male and female students and percentage (76.27%) of original community of research, researchers chose two samples for that, first to build scale for social behavior according to basic components of student's applied behavior . Most important recommendation: Conducting similar studies that deal with behavioral components that researcher proposed according to each of levels that researcher has placed within research. Supporting various curricula and various sporting and social activities that urge social behavior and search for best ways that contribute to development and development in a way that suits university's university life. Take advantage of students who have a very high level of social behavior in leading various social activities inside and outside college.

Keywords
Social Behavior; Psychology of Bilateral; Gender; Geographical Location

INTRODUCTION

Education is important in lives of nations and peoples, as many countries have taken care of because it is basis for progress and its promotion and advancement towards a better future, as it considered that sport is a way to strings and cohesion social ties and social behavior within society in general, including school community, where sport is characterized by values of tolerance, Solidarity and respect for rules of team play, which is a way to maintain physical, vitality and social relations, so we find that countries are always seeking to build a wide base of sport represented by kindergarten, schools, universities, institutes, specialized sports schools, sports clubs and youth centers (Hantoush, 1987) and therefore importance of research comes from importance of student's university stage, especially during application period, which is process of transferring all university education information and experiences that student acquired in four academic stages to an environment that differs from university environment within college, which is school environment is not this is only, but variable that researchers touched on in this study, which is bilateral relationship, has an important and important role in stringing personality of fourth

Received: 01 December 2023 ; **Revised** ; 23 February 2024 ; **Accepted:** 16 April 2024; **Published:** 25 May 2024

How to cite this article: Essa, A.A., Jabes, C.B.E., and Abdulhussein, F.H. (2024 Measuring Social Behavior According to the Psychology of Bilateral Relationships and its Relationship to Gender and Geographical Location for University Students Applying 2022-2023. *Int J Disabil Sports Health Sci*;7(3):676-685.https://doi.org/10.33438/ijdshs.1398172

stage students in college in order to evaluate social behavior. Prosocial behavior plays a crucial role in socializing individuals within society, enabling them to engage and interact with individuals of diverse personalities. It is considered a defining characteristic of being human (Beaty, 2013). Building, legalizing and applying a measure of components of social behavior (his behavior with himself, his behavior with his supervisor's teacher, his behavior with school administration, his behavior within his students inside lesson) according to (bilateral relations) for students applied in Secondary schools 2023. First: Social Behavior is behavior that one takes in relation to social requirements and supplies, and group to which he belongs or towards or individuals of group and social environment (Razouki, 1977).

Standing on state of social behavior of student applied in secondary schools has an influential and effective role in explaining good social behaviors on one hand and withholding unwanted behavior on or hand, and emphasizing activation of all social roles that university student must have during university application stage in Intermediate and secondary schools, so research problem is that achieving sufficient studies in field of social behavior does not reach level to which students of physical education and sports science at University of Basra, especially those components that researchers touched on, which can be nature of dimensions and behavioral components For social behavior in school environment that student possesses, which may stand in way of student's achievement of his goals during application stage, which in turn affects formation of a relationship between him and school community that he tries to live with during that period, and this is confirmed by all sources of sports sociology that sports individuals are with Including college students are distinguished by se characteristics, and y consider that sport is an important and necessary means to achieve a high level of social behavior that leads to consolidation of human relations with various aspects of educational process, and for this reason current research problem came that requires standing on it and finding appropriate solutions to it by measuring social behavior with its components four behavioral, according to bilateral relations of students, during application period, through which those in charge of student community will be able to stand on state of student society, as it has positive or negative behavior within society.

Building, legalizing and applying a measure of components of social behavior (his behavior with himself, his behavior with his supervisor's teacher, his behavior with school administration, his behavior within his students inside lesson) according to (bilateral relations) for students applied in Secondary schools 2023.

First: Social Behavior is behavior that one takes in relation to social requirements and supplies, and group to which he belongs or towards or individuals of group and social environment (Razouki, 1977).

MATERIALS AND METHODS

Process of selecting curriculum that researcher follows is one of first tasks and procedures that he performs through which he can collect data and information about topic of research and thus test it and infection in its depths to obtain useful results of topic of research and this is called method of research followed, which can be defined as art of correctly organizing series of ideas many to reveal truth (Abdul Rahman, 1977). Therefore, researcher used descriptive approach in field of field survey, which makes studying case mainly for its suitability nature of research problem.

Research Sample

Subject of study chosen by researchers is imperative for define groups of society from which will take information necessary to solve research problem, and thus determining a certain percentage of original community and making it as a suitable sample to study subject of research, which must take place according to rules and conditions for selecting correct samples, and therefore research community is one of students and students of fourth stage in Faculty of Physical Education and Sports Sciences, Basrah University for academic year 2022- 2023, which number (236) of morning and evening studies. As for research sample, it reached (180) male and female students and ir percentage (76.27) % of original community of research, researchers chose two samples for that, first to build scale for social behavior according to basic components of student's applied behavior.

The study was approved colleage physical education sport science (numbered: 8/1045). The training unit reviewed the title of the study and approved the application of the study tools and procedures in the group of schools. Participant provided informed consent, with the volunteer form

covering research details, risks, benefits, confidentiality, and participant rights. The research strictly adhered to the ethical principles of the Declaration of Helsinki, prioritizing participant's rights and well-being in design, procedures, and confidentiality measures.

During application of physical education lesson and sports activity during lesson, as follows:

First- Sample Building Scale

It included a number of experts and specialists in field of sports sociology, sports psychology, a sample of students Faculty of Physical Education and Sports Sciences, as follows:

1) A sample of experts and specialists in field of sports sociology and sports psychology, who number (6) experts and specialists, appendixes (2).
2) A sample of students of Faculty of Physical Education and Sports Sciences, Basrah University, which numbered (20) students for both sex, in order to conduct an exploratory experience and statistical analysis.

Second- Scale Application Sample

A sample students of Faculty of Physical Education and Sports Sciences, Basra University, which numbered (200), with (140) students and (60) students, fourth stage in college, according to following division:

(80) students from Basrah Governorate Center.
(60) students from districts and districts of Basrah Governorate
(40) Students from Basrah Governorate Center.
(20) Students from districts and districts of Basrah Governorate.

Research Objective

Building, codifying and applying a measure of the components of social behavior according to (the psychology of bilateral relations) for students applied in middle schools in 2023.

Applying a measure of the components of social behavior for students enrolled in middle schools in 2023 and analyzing and discussing these results according to logical scientific analysis supported by scientific sources.

Finding the correlation between social behavior and its relationship to gender (males and females) using statistical methods.

Finding the correlation between social behavior and its relationship to the geographical location of residence of the individuals in the research sample.

Research Methodology

The user's approach, which is the descriptive approach in the field survey style conducted by the researcher personally through the data collection methods used, is the most appropriate to the nature of the current research problem.

Information Collection Means

It is no secret to anyone that conducting studies and research requires existence of a tool or a means through which researcher can obtain important data and information of results of his study. In this research, tools and means used by researchers are as follows:

Arab and foreign scientific sources related to the title of the study.

Personal interviews conducted by the researcher before and during the study, specifically with those with specialization and experience in the field of study, who are specialists in the field of general sports psychology and general sports sociology (see appendix 1).

Questionnaires

Research Tool

While a description of scale of social behavior, and procedures for honesty and steadfastness that were in light of m made se tools ready to measure current pure variables.

Social Behavior Scale

For purpose of measuring level of social behavior among students of Faculty of Physical Education and Sports Science, researchers collected paragraphs of social behavior measure according to of bilateral relations with its four components that he chose.

Specifications of scale:

Scale includes (45) paragraphs after selecting paragraphs according to psychology of bilateral relationships adopted by (Shway, 2000)

Integration

Integration in satisfying needs leads to attraction of man towards female, and small towards old man asking for wisdom, and great towards young to show wisdom and kindness, and patient towards doctor, and poor towards rich as much as rich needs poor until his feeling of generosity and giving increases.

Need for Self -Esteem

Characteristics: fear, courage, anxiety, friendship, excellence, success, failure and intelligence, self can only be estimated in presence of others.

Similarity

That most people tend to those who resemble m. In any glaring, we find that women are converging between m together and children as well and adults are attracting among m.

Implicit Estimate

If a person knows that re is someone who praises and admires him, n this leads him to attraction towards or person.

Spatial Rapprochement

Spatial rapprochement increases attraction between people, as neighbors increase opportunities for communication, which provides opportunity to feel similarities and aspects of integration.

Physical Appearance

A person for a good appearance that takes care of his clos and his clos is more attractive than someone who does not seem. Good appearance reflects an arrangement in thinking and good feelings.

I put three alternatives before scale paragraph (applies to me, sometimes, does not apply to me). Alternatives were given weights (1, 2, 3), respectively (1).

Researchers used scientific sources regarding topic of research in collecting vertebrae of scale according to above categories, and outcome was that if researcher was able to draw (45) paragraphs and as follows:

Student's social behavior with himself and number of his paragraphs (11)

Student's social behavior with school administration and number of his paragraphs (12)

Student's social behavior with his supervising professor and number of his paragraphs (11)

Student's social behavior with students of his studies and number of his paragraphs (11) researchers presented standard formulas in its initial form to a number of experts and specialists in field of general and athletic psychology and general and sports sociology, attached 2, to show validity of scale paragraphs for purpose for which were set and adjusted some of properly, it was agreed to keep paragraphs that get percentage of agreement of 80% of answers of arbitrators about its validity, and it turns out that re are (5) paragraphs less than required percentage and se paragraphs were excluded, and formulation of some paragraphs is amended in proportion to axis to which y belong and according to opinion of experts, and thus number of paragraphs became as follows (40) paragraphs As follows:

Sincerity of Scale

Student's social behavior with himself and number of his paragraphs (10)

Student's social behavior with his supervisor teacher and number of his paragraphs (10)

Student's social behavior with students of his studies and number of his paragraphs (10)

Statistical Analysis of Paragraphs

Statistical analysis of paragraphs is a necessary steps in building standards of personality, because logical analysis (experts and specialists) may not reveal sincerity of paragraphs in a precise way sometimes. This statistical analysis should be accompanied to know extent of paragraphs' ability to distinguish between respondent and homogeneity with total degree of scale (EBEL, 1972). As a result, researcher calculated discriminatory force of paragraphs after he applied survey researcher to a sample of female students, and after that he calculated level of total scale and each scale, according to places placed.

Discriminatory Power

Discriminatory power means ability of paragraph to distinguish between people with" higher levels and those with minimum levels of individuals in relation to feature of preparing its measurement" (Scannell, 1975). And researcher used law of his discrimination laboratories, and after researcher completed application of statistical law after applying scale to a sample of female students in college (20) (were excluded in main experience), it became clear that re is no paragraph that is less than (0.40) that is less than (0.40) It is a good standard for discrimination laboratory that can give precise and correct results.

Account of sincerity and stability of scale

Factors of sincerity and stability of measurement of standards and tests are among most important characteristics that must be available in psychological and social standards and whatever purpose of its use (Scannel, 1975) Allawi confirms that, in" order to use and apply standards and tests, it was necessary to provide measures of quality of scale "honesty - stability" that to ensure ruling on its validity and what was set for its measurement (Allawi, 2000) Here, researchers measured sincerity and steadfastness of scale as one of basic conditions for measurement process, which is as follows:

First

Apparent Honesty

apparent honesty is considered one of most important types of honesty required in building physical, psychological and social tests. Researcher has been achieved from this honesty through arbitration of experts and specialists, who number (9) to arbitrate scale vertebrae and assert that represent paragraphs and phrases that evaluate and measure what was put for it.

Second

Content is True

Researchers confirmed sincerity of content of scale by presenting it to some professors of sports psychology and sports sociology, and everyone agreed to integrity of formulation of phrases and its content and main axes and link of each phrase to axis that follows it as well as realism of phrase and its representation of attribute to be measured.

Calculating Stability of Scale

Several ways to calculate stability of scale, most important of which is method of re -testing. This method is to apply scale to a sample of students and thus re -apply it to same Among college students are (10) students, and it became clear that value of correlation laboratory reached (0.76) and when compared to tabular value, it turned out that scale has a high stability factor and it indicates stability of value of total scale when applying it more than once to players, and here researcher achieves second goal For validity of scale.

Scale Levels

Extraction of special levels of social behavior is considered one of important and main steps in determining value of characteristic to be measured, and is also called standard levels that Scott knows (tables used to explain test scores where se levels can be used to explain to us level of laboratories Emnius Mikhail, 1996) In order for researcher to extract se levels, he resorted to following steps:

1/ calculating standard degree that scientists set to be between (+3, -3). To get rid of previous value, researcher calculated modified normative degree, which was scientifically determined between (80-20). By calculating se degrees, researcher can determine standard levels of his scale.

Table 1. Shows standard and raw levels of research sample of social behavior scale and its components

Levels	Standard Degree	Modified Degree	Raw Degree Social Behavior	Raw Degree Behavior With Himself	Raw Degree Behavior With His Teacher	Raw Degree Behavior With School	Raw Degree Behavior With His Students
Very good social behavior	(1.8+) – (3+)	69-80	105-120	26-30	27-30	27-30	26-30
Good social behavior	(0.6+)-(1.8+)	57-68	87-104	20-25	21-26	23-26	22-25
Medium social behavior	(0.6-) -(0.6+)	45-56	65-686	16-19	16-20	19-22	17-21
Acceptable social behavior	(1.8-) –(0.6-)	33-44	49-64	13-15	13-15	14-18	13-16
Poor social behavior	(3-) - (1.8-)	20-32	40-48	10-12	10-12	10-13	10-12

Scale Application

Scale has become ready to apply it in its final form to students of fourth stage in Faculty of Physical Education and Sports Sciences, Basrah University, who numbered (200) male and female students, and extracted real grades and put m within levels of scale that he previously extracted.

Statistical Means

Used Researchers used following statistical processors program. Statistical program was used in the statistical analysis of the data obtained. Celsius, Mass, Standard Deviation, Simple Law, Hypothesis medium, Standard (T -test), modified normative degree (osmosis)

RESULTS

View, analyze and Discuss results

This chapter includes presentation of results of researcher and interpretation in light aim set as a result of application of research tools represented by scale of social behavior in its components according to bilateral relationships. To achieve objectives of research, arithmetic average and standard deviation of members of research sample of (200) male and

female students were calculated. Theoretical average. For a statistically significant difference test, researchers used T - test for one sample, see Table (2).

Table 2. Shos value of (T Test) for differences between average sample degrees and median average of scale social behavior

Sample Median	Standard Devotion	Theoretical Median	T Test Value		Freedom Degree	Indication
			Collected	Table		
103 ,64	3,83	80	9,805	1,65	199	0,05

It is evident from Table (2) when comparing Total value calculated with TD value, that calculated value is higher than gratitude of gratitude, and this indicates that se differences are statistically significant and in favor of average sample.

Presenting, analyzing and discussing results of social behavior scale with four components for students

Table 3. Shows distribution of research sample at levels of social behavior scale for students, according to geographical location

No	Categories	Levels	Student sample			
			Center of governorate		Remote of governorate	
			No	Percentage	No	Percentage
1	105-120	Very good social behavior	39	%48.75	25	%41.66
2	87-104	Good social behavior	36	%45	29	%48.33
3	65-686	Medium social behavior	5	%6.25	6	%10
4	49-64	Acceptable social behavior	0	0	0	0
5	40-48	Poor social behavior	0	0	0	0

It is clear from Table (3) that most of students of research sample of students at center and parties of governorate may be distributed within levels (very good, good), we note that percentage of students who obtained a level of social behavior (very good) had members of provincial center followed by a good level While students who live and apply to of Basrah Governorate, largest percentage of social behavior was within a (good) level followed by a (very good) level. ***Presenting, analyzing and discussing results of social behavior measure with four components***

It is clear from Table (4) that highest percentage of number of members of research sample of female students at level of social behavior in all its components was from center and parties of province, were distributed within levels (very good, good) without difference for proportions and in favor of level (very good) followed by a level (good) Without influence of se numbers, city center or its outskirts.

Table 4. Shows distribution of research sample at levels of social behavior scale for female students, according to geographical location

No	Categories	Levels	Girls sample			
			Center of governorate		Remote of governorate	
			No	Percentage	No	Percentage
1	105-120	Very good social behavior	21	%52.5	10	%50
2	87-104	Good social behavior	18	%46.25	8	%40
3	65-686	Medium social behavior	1	%1.25	2	%10
4	49-64	Acceptable social behavior	0	0	0	0
5	40-48	Poor social behavior	0	0	0	0
		Total	40	%100	40	%100

Display, analysis and discuss results of correlation of degrees of social behavior scale with its four components according to gender variable (students- students).

Table 5. Shows value of computational circles and standard deviations values results of social behavior measure according to gender variable

Sex	No	Median Arithmetic	Standard Devotion	T value		Indication
				Collected	Table	
Mal	140	106.5	2.88	3.973	2.084	Moral
Female	60	91.54	3.18			

To achieve this goal, correlation coefficient was calculated between degrees of social behavior scale between male and female students using Test factor, and a statistically significant relationship appeared at level (05, 0), as calculated T - value (3.937) was higher than tabular value It is (2.084) and for benefit of social behavior without students.

DISCUSSION

It is evident from Table (2) when comparing Total value calculated with TD value, that calculated value is higher than gratitude of gratitude, and this indicates that se differences are statistically significant and in favor of average sample. , And hypothesis of scale. "This result may be explained that students of College of Physical Education and Sports Sciences at university are conscious social segments that merged into university environment and social, educational, moral and scientific commitment it imposes on it, which must be enjoyed regardless of external environment in which he lives student outside university, which is one of most important goals of university education, is to achieve interaction and a social behavior in a manner consistent with nature of university environment, which made him a student with mental flexibility, and (Muhammad, 1999) confirms that this behavior that makes ability to acquire desired social behavior It is determined in various curricula and various activities that are presented to m within college environment in order to achieve educational goals of university education. Practice of sports activities enables students to acquire many correct values and good behaviors, which reflect image of correct athlete, with all values and good moral characteristics that must be acquired as a result of sports activity.

Sports in order to achieve success and excellence in university studies, but we cannot lose sight of nature of life and social patterns that are characterized by students who live in center of province without residents of parties, and if university life is same as all students coexist with, but male element is more affected by social life and development life is outside walls of college from m students of outskirts of province and nature of social traditions y live in areas of residence. activity in which students participate consisting of two or more students involves in eyes of some individuals on social value and possibility of satisfying certain social needs and it is not available in life of center without parties and development of social behavior, and in spite of this, activity as a social experience is characterized Through sports (physical) activities that often contribute to providing social behavior and that allows possibility of identifying new individuals and forming relationships between people (Allawi, 1998)

Researcher attributes stability of rates of college students in city center and its parties to nature of feminist component in dealing with university life, it inside or outside university, not only this, but that movement of female students outside walls of university life is disturbed and limited by traditions and social system of Iraqi society and etc. It imposes it from restrictions on feminist component without male element, which is more open to university environment and external life, but students are more balanced and flexible in social dealing and gaining behavior of social life, analyzing and employing m in a way that serves methods of applying social behavior balanced inside and outside college walls and all se behaviors have acquired College students from within theoretical and practical lessons presented by university professor inside lesson and during educational counseling process, as well as what is imposed by life and university environment that is considered a vital institution in development of social aspects of individuals. It also represents

important and influential fields in process of sports, physical and skilled numbers, and from here we note that here is a clear connection between sporting personality and development of psychological and social characteristics because y achieve distinguished and beneficial symptoms in building social relations and development and affirming human aspects and instilling a spirit of cooperation and a sense of responsibility between its members and also confirms that what is Its sporting life does not stop at geographical area it occupies, but goes beyond most distant areas to contribute to various aspects that are related to youth and sports events in order to achieve its great goals in promoting social, economic, educational and cultural development in society (Al -Azzawi, 2002). One of tasks of physical education is to work on developing characteristics of good personality that is appropriate for field in which sports individual practices his activities. Sports activities develop characteristics of good personality, so coach must take advantage of this opportunity to develop features that have ability to serve physical, skill, tactical and educational goals Psychological and social, such as working to develop spirit of altruism, cooperation, humility, discipline, or features within sports stadiums, which in turn increase social behavior between athletes (Taleb , 2000). From previous schedule, it is clear that (average) level is a very small percentage compared to size of sample and or levels that researcher obtained, and this can be explained that se students were not affected by role played by exercise of sports activity in social and psychological numbers by mixing colleagues or university assigned professor process of supervising m, as well as lack of benefit from educational aspects that work through process of university education to develop and advance m to what is better, and therefore this is negatively reflected on respect for values and traditions that practitioner of sports activities, which leads to a low commitment to values and norms Social and what this supports is that university education helps to uphold values of loyalty to society and take responsibility, value of social readiness (Issam, 1999). Emergence of social behavior of this simple number of members of research sample can be considered an indication of lack of social contact with se students with colleagues or teachers and not creating a social environment that opens way for students social behavior among m during matches and daily university education units that player receives, this is on one hand, On or hand, trainer is associated with students through process of university education and matches only, which are far from social relationships and ties that are outside environment, university education, and that individuals who do not have social relations with colleagues find that each of m has official social life with others, which makes this Relationships and connections affect behavior as a group in work and sports activity and in performance of collective work (Marwan, 2000). bottom line emphasizes importance of role of sports activity in activating role of social behavior if sporting individual wants to increase its role in forming social relations with his colleagues sources indicate that sport has become a social model and a bowl of great social values in society, and highlights basic equality during University life, as every athlete or educated, no matter how moderate social, is required to implement same laws, regulations and mimetically standards, and that what distinguishes it from others is determined by its mimetically efficiency (Al -Abadi, 1989).

Conclusions

The researcher believes that the stability of the rates of access for female college students in the city center and its outskirts is due to the nature of the feminist element in dealing with university life, whether inside or outside the university.The researcher believes that the movement of female students outside the walls of university life can often be restricted and limited by the traditions and social system of Iraqi society and the restrictions it imposes on the female element rather than the male element, which is more open to the university environment and external life. The researcher believes that female students are considered more balanced and flexible in social interaction and in acquiring social life behaviors, analyzing them, and employing them to serve the methods of applying balanced social behavior inside and outside the college walls. The researcher sees that all of these behaviors were acquired by college students from within the theoretical and practical lessons provided by the university professor within the lesson and during the educational counseling process.

The researcher believes that what life and the university environment, which is considered a vital institution, imposes, is the basic and real role in developing the social aspects of individuals. The researcher sees here a clear link between the athletic

personality and the development of psychological and social qualities because it achieves distinct and useful purposes in building and developing social relationships, emphasizing the human aspects, and instilling a spirit of cooperation and a sense of responsibility among its members. The researcher believes that what sports life develops does not stop at the geographical area it occupies, but rather extends beyond that to more distant areas to contribute to various aspects related to youth and sports activities. The researcher believes that achieving and promoting social, economic, educational and cultural development in society is one of the tasks of physical education, which works to develop good personal qualities that are appropriate to the field in which the individual athlete practices his activity. The researcher believes that sports activities develop good personality traits, so the coach must take advantage of this opportunity to develop traits that have the ability to serve the physical, skill, tactical, educational, psychological, and social sports goals, such as working to develop the spirit of altruism, cooperation, humility, discipline, or other traits within the sports fields, which In turn, it increases social behavior among athletes.

The researcher believes that these students were not affected by the role played by practicing sports activity in preparing them socially and psychologically through their mingling with their colleagues or with the university professor charged with supervising them. The researcher believes that their lack of benefit from the educational aspects that work through the university education process to develop and advance them to what is better, and therefore this reflects negatively on the respect for the values and traditions that the practitioner of sports activities has. The emergence of social behavior for this small number of individuals in the research sample can be considered an indication of the lack of social interaction of these students with their colleagues or teachers and the failure to create a social environment that opens the way for students to behave socially among themselves during matches and the daily university education units that the player receives. The researcher believes that the coach must be connected with the students through the university education process and matches only, which are far from social relationships and ties that are outside the university educational environment. The researcher found through the results that individuals who do not have social relationships with their colleagues, we find that each of them has an official social life with others, which makes these relationships and connections affect their behavior as a group at work and sports activity and in their performance of their collective work. The researcher confirms through scientific sources the fact of the importance of the role of sports activity in activating the role of social behavior if the individual athlete wants to increase his role in forming social relationships with his colleagues.

Research sample has a high level that ranges between (very good and good) of students' social behavior. Research sample has a high level between (very good and well) of social behavior of students. Students and students of research applied in city center were better than those applied in districts and aspects in measuring social behavior with its four components. Presence of statistically significant differences in level of social behavior among college students according to gender variable and geographical location variable of application

Recommendations

The researcher has developed his recommendations according to the results he obtained, and they are all similar to the results he obtained, and they can be adopted fundamentally for these results, and the recommendations can be expanded upon if the researcher expands on other research variables. Conducting similar studies that deal with behavioral components that researcher proposed according to each of levels that researcher has placed within research. Supporting various curricula and various sporting and social activities that urge social behavior and search for best ways that contribute to development and development in a way that suits university's life. Take advantage of students who have a very high level of social behavior in leading various social activities inside and outside college. Encouraging students to contribute to various activities of college, with aim of developing social relations based on love, cooperation, giving and self -denial in a way that serves goals and goals of society in general. Increasing interest in university students, by helping to identify problems and difficulties to find solutions to m and overcome m with aim of achieving aspirations in a way that enhances concept of self and brings to a high level of social behavior. Developing a sense of importance and status of university student and its role in serving

country and others through human relations between professor and student and between administration and student, which leads to respecting his behavior and behavior to him to social behavior to be able to give more to serve country and nation

Conflict Of Interest

This research no conflict of interest. No financial support was received.

Ethics Statement

The study was approved colleage physical education sport science (numbered: 8/1045). The training unit reviewed the title of the study and approved the application of the study tools and procedures in the group of schools.

Author Contrıbutıons

Study Design, AAE and CBEJ ; Data Collection, AAE, CBEJ and FHA; Statistical Analysis, CBEJ and FHA; Data Interpretation, AAE and CBEJ; Manuscript Preparation, AAE, CBEJ and FHA; Literature Search, AAE, CBEJ and FHA. All authors have read and agreed to the published version of the manuscript.

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