IJDSHS

INTERNATIONAL JOURNAL OF DISABILITIES SPORTS & HEALTH SCIENCES

Volume: 6 Issue:2 June 2023

e-ISSN 2645-9094 TURKEY

Volume: 6 Issue: 2 June 2023

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

EDİTOR IN CHİEF

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Volume: 6 Issue: 2 June 2023

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

ADVİSORY BOARD

Volume: 6 Issue: 2 June 2023

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

You can receive an **ORCID iD** number from https://orcid.org/register.

PUBLICATION FREQUENCY

The IJDSHS accepts the articles in English and is being published 2 times (June and December) a year.

CORRESPONDENCE ADDRESS

Journal Contact: ijdshs@gmail.com

Editor: ijdshs.editor@gmail.com

Volume: 6 Issue: 2 June 2023

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

INDEX COVERAGE

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Volume: 6 Issue: 2 June 2023

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

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

RESEARCH ARTICLE

Some Anaerobic Performance Variation From Morning to Evening: Warm up With Different Music Rythm Impacts Performance and Its Diurnal Amplitude in Intellectual Disabled People

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Abstract
The aim of this study is to investigate the effect of functional warm-up (FWU) in different musical rhythms on anaerobic performance of mentally retarded individuals from morning to evening. Fourteen (7 male, 7 female) moderately and mildly ID individuals aged 11-14 years participated in this study. In the study, participants received no music (NM), a low music phase (LMP) phase (80-90 bpm), a modarate musical rhythm phase (MMP) (130-140 bpm), and a high music phase (HMP) (170-180 bpm) with FWU applied. To determine anaerobic performance after FWU protocol. FWU and then Sargent protocol vertical jump test was performed while playing music. The same procedure was repeated in the morning (between 08:00 a.m.-10:00 a.m.) and in the evening (between 16:00 p.m.-18:00 p.m.). In the study, participants' anaerobic power level increased significantly from morning to evening as the music rhythm increased (p= .000, F=8.643). According to the post-hoch test, there was a significant difference between the NM phase in the morning (M) and the MMP-M (p= .003), the HMP-M (p= .003), the MMP in the evening (E) (p=.003), and the HMP-E (p= .001). There was no significant difference between the LMP, MMP and HMP values in the morning and the music given in the evening. According to the results of our study, the anaerobic power values of the ID individuals were higher in the evening. However, it was found that they could reach their performance level in the evening if they listened to low, moderate and high rhythm music in the morning.

Keywords
Intellectual Disabled People, Diurnal Variation, Music Rhythm, Anaerobic Performance

INTRODUCTION

Sport is an important phenomenon in the reintegration of people with disabilities into society (Iyer et al., 2019). One of the main purposes of physical activities for people with disabilities is rehabilitation (Hoekstra et al., 2019; Yılmaz et al., 2021) and socialization (Bessa et al., 2019). However, in recent years, people with disabilities at the national and international levels have been using sports not only as a means of rehabilitation and socialization, but also to enhance performance (Cherif et al., 2022). Although the type of sports activities is important in increasing the level of performance (Hammami et al., 2019), the timing of the activity is also an important factor that affects the level of performance (Eken et al., 2022; Nişli et al., 2021).

Like all living things, the human organism is subject to variability according to environmental differences that occur as time changes (Rosa et al., 2016). Biological rhythm is a cyclic variation that repeats sequentially in a certain period of time and at certain intervals. The branch of science that

Received: 06 February.2023 ; **Accepted:** 20 March 2023; **Online Published:** 30 March 2023
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How to cite this article: Kurtoğlu, A. (2023). Some Anaerobic Performance Variation From Morning to Evening: Warm up With Different Music Rythm Impacts Performance and Its Diurnal Amplitude in Intellectual Disabled People. *Int J Disabil Sports Health Sci*;6(2):82-90. https://doi.org/10.33438/ijdshs.1248438

studies the effects of biological rhythms and the factors that determine biological rhythms is chronobiology. In chronobiology, the dark-light cycle and the associated variability associated with a solar day are referred to as circadian rhythms (Geng et al., 2022). Circadian rhythms are controlled by an internal circadian "clock" that is responsible for regulating the daily function of all major organs (Hofman & Swaab, 2006; Martin et al., 2016). These rhythms are critical for maintaining various positive health outcomes in humans (Schroder et al., 2015). The body clock, also known as the circadian rhythm or diurnal variability, is controlled by the suprachiasmatic nuclei at the base of the hypothalamus (Waterhouse et al., 2005). Blanchet et al. argued that slowing of the MYT1L variant, which is an important gene for hypothalamic activities, is associated with ID syndrome and obesity (Blanchet et al., 2017). Therefore, individuals with ID are expected to have different biological characteristics than healthy individuals.

Many people like to listen to music during physical activity. It is known that personal well-being increases during physical activities with music (Bayrakdaroğlu et al., 2022). However, studies on the effects of music on athletic performance have yielded mixed results. While some studies have focused on the effects of the type of music chosen, others have suggested that the timing of music can influence anaerobic performance (Castañeda-Babarro et al., 2020). It has also been suggested that changes in mood, motivation, warm-up speed, and adaptation of music can lead to increased performance (Ballmann et al., 2018; Nakamura et al., 2010).

In the literature, individuals with ID are thought to elicit different neural responses than healthy individuals and consequently have different biological rhythms. The number of studies investigating the effects of music on biological rhythms and performance levels in ID individuals is also limited. Therefore, the aim of this study was to investigate the anaerobic performance of ID individuals from morning to evening at different music rhythms.

MATERIALS AND METHODS

Participants

A criterion sampling method was used to determine the sample group. Individuals with moderate and mild intellectual disabilities participated in the study. Participants were classified by experts from the Guidance Research Center according to their IQ levels, in accordance with the limits established by the American Association on Intellectual and Developmental Disabilities (AAIDD). Accordingly, mild intellectual disability = 55-70 IQ, moderate intellectual disability = 40-55 IQ. The consent of all volunteers was obtained, and their participation was ensured regularly. This study is approved by the Bandırma University (BU) and Human Research Ethics Committee of the BU (Approvel Nummer: 2022/221). All participants gave their written informed consent, and our study was carried out following the Helsinki Declaration. Even men and seven women volunteers who are mentally disabled (n=14), participated in the study. None of the participants had regular exercise habits and there was no injury to the upper or lower extremities in the last 6 months. Mentally disabled volunteers reported having no problems with insomnia or anxiety.

The minimum sample size for the present study was calculated using G-power software 3.1.9.7. (University of Dusseldorf, Dusseldorf, Germany). According to this analysis; a priori and F tests were used to calculate power following our study's design; within-factors; α err prob = 0.05; minimum effect size= 0.35, and power (1-β err prob)= 0.80. The power analysis indicated a minimum of twelve participants in study. Before the study, mentally disabled volunteers were asked to night sleep at least 8 hours before each test session, and to come on a full stomach, provided that they had food at least two hours before the morning and early evening session. The study was conducted 3 weeks (December-2022). The participants were given necessary information about not doing high-intensity exercise, and not using substances such as alcohol and caffeine (Reilly et al., 2007). Mentally disabled volunteers were selected using the inclusion criteria; volunteers did not have any health problems in performing tests and practicing exercises, following the researchers' instructions during the study, and the absence of any known sleep disturbances. A history of sleep disturbances, disobedience to investigators' instructions during the study, and the occurrence of any health problems during performance tests were reported as exclusion criteria for study participants.

Table1. Classification of participants

Participants (P)	Disability classification
P1	Mild intellectual disability
P2	Mild intellectual disability
P3	Moderate intellectual disability
P4	Mild intellectual disability
P5	Mild intellectual disability
P6	Moderate intellectual disability
P7	Moderate intellectual disability
P8	Mild intellectual disability
P9	Moderate intellectual disability
P10	Moderate intellectual disability
P11	Mild intellectual disability
P12	Moderate intellectual disability
P13	Mild intellectual disability
P14	Moderate intellectual disability

Study Design and Data Collection

The FWU and vertical jump tests were performed with participants in the presence of an expert instructor. Before all tests, a 2-day familiarization period was conducted to familiarize participants with the FWU and the vertical jump test. The FWU was performed by a specialized researcher using the show-and-make technique. The resting heart rate of the participants were measured by themselves using the Polar RS400 as soon as they got out of bed in the morning, without speaking or moving. The Sargent vertical jump performance of the participants were measured after FWU [No music (NM), Low rhythm music phase (LMP), Moderate rhythm music phase (MMP), High rhythm music phase (HMP)] in two different time periods of the day (between 08:00 am and 10:00 a.m. and 16:00 pm and 18:00 p.m) with at least 2 days between each other. The music used throughout the work was the same, only the rhythms were changed. In this way, the effect of different songs was prevented. The mentally disabled volunteers used to train regularly regardless of the time they participated in the study between 08:00–10:00 a.m. and 16:00–18:00 p.m. Volunteer mentally disabled volunteers are participants of World Health Organization (WHO) adults who perform at least 150 minutes of moderate or 75 minutes of vigorous physical activity (FA) or exercise per week (American College of Sports Medicine, 2018). The same times of day were utilized in the study design. Consequently, it was intended to determine the amount to which the standardized design, which had been produced before to the study, affected the performance testing. During the familiarization phase and the continuation of the experimental design, no further training program was administered to the mentally challenged volunteers beyond the research protocol. As a result, the following protocols were established (Fig. 1).

a) No music (NM);

First, the warm-up was implemented by running for 5 minutes at a heart rate corresponding to 50% of the determined heart rate reserve (HRR). The intensity of the warm- up was determined by calculating 50% of the HRR using the formula of Karvonen. The calculation of the Karvonen formula was as follows: HRR=exercise intensity×(maximum heart rate−resting heart rate)+resting heart rate (Karvonen MJ, Kentala E, 1957; Nes et al., 2013). The heart rates of the subjects were monitored during the 5-minutes warm-up using a Polar RS400 watch. After 5 minutes warm up, linear + lateral warm up (FWU) was made. FWU exercise consisted of stationary spider-man (30 s work – 30 s rest), inchworm (30 s work – 30 s rest), backward and forward lunge walks [2× (30 s work – 30 s rest)], backpedal (30 s work – 30 s rest), straight-leg skip (30 s work – 30 s rest), heel-ups [2× (30 s work – 30 s rest)] and high knee run [2× (30 s work – 30 s rest)] (Eken, et al., 2022).. This protocol consisted of 15 minutes.

b) *Low rhythm music phase (LMP);*

The same procedure above was used with LMP. In music condition, participants applied to 15 minutes of warm up by listening to music (80 to 100 bpm) rather than just warm up (Edworthy & Waring, 2006; Karageorghis et al., 2008). Fifteen minutes warm up consisted of running for 5 minutes at a heart rate corresponding to 50% of the determined HRR and 10 minutes FWU exercises (stationary spider-man (30 s work – 30 s rest), inchworm (30 s work – 30 s rest), backward and forward lunge walks [2× (30 s work – 30 s rest)], backpedal (30 s work – 30 s rest), straight-leg skip (30 s work – 30 s rest), heel-ups [2× (30 s work – 30 s rest)] and high knee run [2× (30 s work – 30 s rest)]) (Eken et al, 2022).

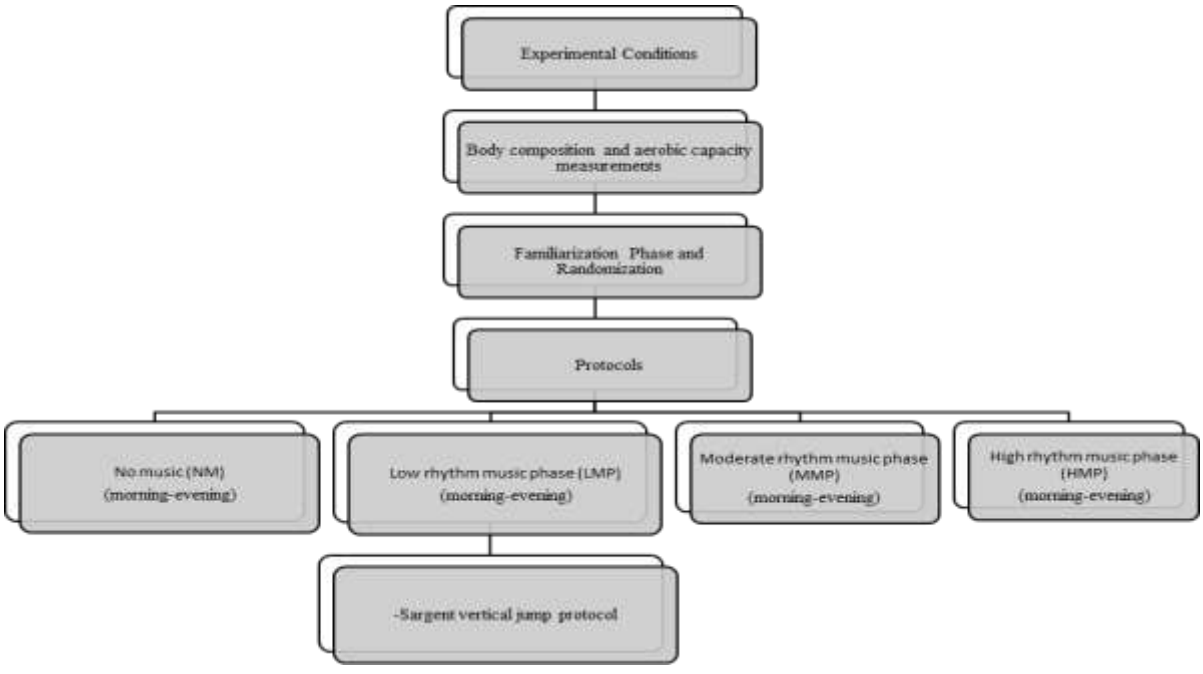

Figure 1. Experimental conditions

c) Moderate rhythm music phase (LMP);

The same procedure above was used with MMP. In music condition, participants applied to 15 minutes of warm up by listening to music (120 to 140 bpm) rather than just warm upModerate rhythm music phase (MMP); the same procedure above was used with MMP. In music condition, subjects applied to 15 minutes of warm up by listening to music (120 to 140 bpm) rather than just warm up by pedaling (Edworthy & Waring, 2006; Karageorghis et al., 2008). Fifteen minutes warm up consisted of running for 5 minutes at a heart rate corresponding to 50% of the determined HRR and 10 minutes FWU exercises (stationary spider-man (30 s work – 30 s rest), inchworm (30 s work – 30 s rest), backward and forward lunge walks [2× (30 s work – 30 s rest)], backpedal (30 s work – 30 s rest), straight-leg skip (30 s work – 30 s rest), heel-ups [2× (30 s work – 30 s rest)] and high knee run [2× (30 s work – 30 s rest)]) (Eken et al., 2022).

d) High rhythm music phase (HMP);

The same procedure above was used with MMP. In music condition, participants applied to 15 minutes of warm up by listening to music (160 to 180 bpm) rather than just warm up (Edworthy & Waring, 2006; Karageorghis et al., 2008). Fifteen minutes warm up consisted of running for 5 minutes at a heart rate corresponding to 50% of the determined HRR and 10 minutes FWU exercises (stationary spider-man (30 s work – 30 s rest), inchworm (30 s work – 30 s rest), backward and forward lunge walks [2× (30 s work – 30 s rest)], backpedal (30 s work – 30 s rest), straight-leg skip (30 s work – 30 s rest), heel-ups [2× (30 s work – 30 s rest)] and high knee run [2× (30 s work – 30 s rest)]) (Eken et al., 2022).

Anthropometric measurements

When measuring individual subjects, their body weights were calculated with 0.1 kg of precision using an electronic scale (Tanita SC-330S, Amsterdam, Netherlands) (kg). Using a stadiometer (Seca Ltd., Bonn, Germany) with an accuracy of 0.01 m, the height of each participant was obtained during the measuring process. An electronic scale (Tanita SC-330S, Amsterdam, Netherlands) was used to measure and record the BMI and lean-to-fat ratio of each participant (American College of Sports Medicine, 2018).

Vertical jump test

Sargent test protocol was applied to determine the vertical jump performance of the participants (Ayán-Pé Rez et al., 2017). Accordingly, the participant waited with both feet facing a smooth wall. A mark is drawn on the highest point it reaches. Then the participant was asked to jump as high as possible and the distance he reached was re-drawn with chalk in his hand The distance between the two drawings was recorded in cm. The participant had two trials and the best value was recorded (Bui et al., 2014).

Statistical Analysis

In this study, the analysis of normality was performed with the Shapiro-Wilk test, which is used for quantitative data. Because the data were normally distributed, they were expressed as mean and standard deviation. The measurements of the different protocols (NM, LMP, MMP, HMP) were tested with the Anova test for repeated measurements from morning to evening. To test the homogeneity of variances, the Mauchly test was performed and the Greenhouse-Geisser correction was applied. Partial Eta squared (ηp2) was used to determine the effect size between groups. Bonferoni, one of the post-hoch tests, was used to determine the difference between groups in the study. The significance level in the study was set as p< .05. Statistical operations were performed using IBM SPSS version 25 software (New York, USA). Graphs were generated using GraphPad Prism 9 software.

RESULTS

Table 2 shows the anaerobic power results of different musical rhythms of the participants from morning to evening. Accordingly, the participants' performance level was lowest at NM -M (20.17±6.89 cm). A significant difference was found between the musical rhythm protocols from morning to evening (F=8.643, p= .000, η_p^2=0.39).

Table 2. Anaerobic performance results of the participants from morning to evening in different musical rhythm

Protocols	Mean ± SD	Between Measurement F-value p-value η_p^2
NM-M (cm)	20.17±6.89	
LMP-M (cm)	22.67±6.88	
MMP-M (cm)	23.89±6.85	
HMP-M (cm)	25.14±7.30	F= 8.643 p<0.001 η_p^2=0.39
NM-E (cm)	22.57±6.67	
LMP-E (cm)	23.35±7.51	
MMP-E (cm)	23.14±6.71	
HMP-E (cm)	24.64±7.02	

Figure 2 shows the results of the post-high analysis of the participants' vertical jump test results. After post-high analysis, NM -M (20.17±6.89 cm) and MMP-M (23.89±6.85 cm) (p= .003), HMP-M (25.14±7.30 cm) (p= .003), LMP-E was found to have a statistically significant difference between (22.67±6.88 cm) (p= .003), HMP-E (24.64±7.02 cm) (p= .001).

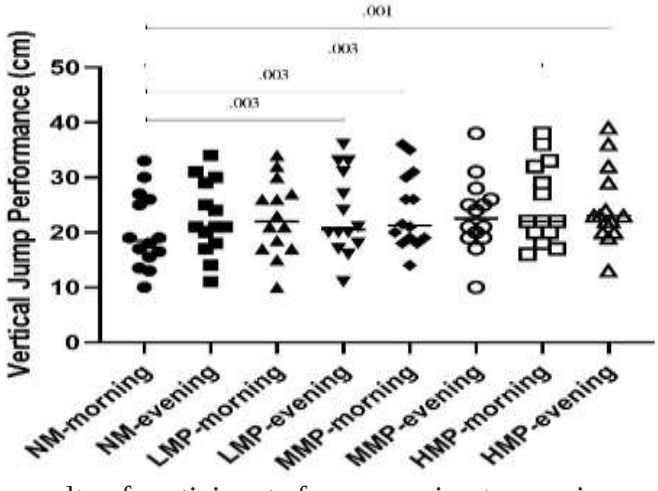

Figure 2. Vertical jump results of participants from morning to evening

DISCUSSION

In our study, the lowest anaerobic power levels of ID subjects in the morning were in the NM phase. As the music rhythm increased, the anaerobic power levels increased more. Most notably, anaerobic power levels were highest in HMP and evening ID subjects. To our knowledge, this is the first study to examine anaerobic performance in ID subjects in terms of diurnal variability and the influence of music rhythm on this performance level. Our hypothesis that the anaerobic performance of ID subjects differs at different music rhythms from morning to evening was thus confirmed.

There are many studies reporting that music has positive effects on athletic performance (Blumenstein et al., 1995; Pates et al., 2003; Tate et al., 2012). In addition to music, diurnal variability is also critical to performance levels (Kusumoto et al., 2021). Simpson et al. examined the effects of sprint performance with and without music in healthy individuals and found that sprint performance was higher with music (Simpson & Karageorghis, 2006). In a meta-analysis by Castañeda-Babarro et al. the studies on the effects of listening to music on anaerobic performance are controversial, but it may physiologically increase anaerobic performance (Castañeda-Babarro et al., 2020). In some studies, results have been obtained showing that music has no effect on performance levels (Atan, 2013). These results show that the type, rhythm, or duration of music affects the results of the studies. In a study conducted by Hammad et al. it was found that the systolic heart rate of Taekwondo athletes increased significantly when the music rhythm was fast (Hammad et al., 2019). When investigated in this context, results were obtained that support our research.

In a study conducted by Chtorou et al. in which the muscle power generated was examined as a function of diurnal variation in music, it was reported that the power level was reached in the evening when music with lower power was listened to in the morning (Chtourou et al., 2012). This study shows similar results to our study. Other studies have shown that performances in diurnal variation also vary according to the type of music. In the study conducted by Belkhir et al. the vertical jump performances were determined according to diurnal variation with synchronized music, with motivational music and after the warm-up protocol without music. In this study, it was found that performance levels were higher in the evening than in the morning, warm-up exercises with music performed better than warm-up exercises without music, and it was found that warm-up with motivational music was more effective (Belkhir et al., 2020).

When we examined the literature, similar results were obtained as in our investigation. One of the main limitations of our study is that our sample group consists of individuals with moderate and mild ID. Therefore, the results of our study cannot be generalized to all IDs. The results of our research will provide important results for the activities that should be performed in the evening to provide more benefits in anaerobic activities that can be applied to individuals with moderate and mild ID. It will also have the effect of playing music in the range of 170-180 bpm to achieve a similar level of performance in the morning. Considered in this context, the results of this study will help to design physical education and sports activities that can be applied to ID individuals. In this study, only the anaerobic performance levels of ID individuals were investigated. The effects of various performance indicators can also be investigated.

Conflict of interest

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

Ethics Committee

This study is approved by the Bandırma University (BU) and Human Research Ethics Committee of the BU (Approvel Nummer: 2022/221).

Author Contributions

Planned by the author: Study Design, Data Collection, Statistical Analysis, Data Interpretation, Manuscript Preparation, Literature Search. Author 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

Determination of Anthropometric Measurements and Nutritional Status of Wheelchair Basketball Players

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Abstract
The aim of this study was to determine the anthropometric measurements, nutritional habits, and nutritional knowledge levels of wheelchair basketball players. Anthropometric measurements and 24-hour food consumption records were taken from 29 wheelchair basketball players and a structured questionnaire about nutritional habits and knowledge levels **was** applied to 40 wheelchair basketball players by face-to-face interview. The median values of the anthropometric measurements of basketball players were within the reference range (21.6 kg/m^2 for female players, 22.7 kg/m^2 for male players). Fifty-two percent of basketball players find their nutritional knowledge level sufficient, 47.5% use media for the source of nutritional information, 45% skip lunch, and 12.5% drink water >2 L/day. The health complaints of basketball players were mostly frequent cramps (17.5%) and cold (17.5%). Nutrients that the majority of basketball players consumed below the estimated average requirements were found to be carbohydrate, fiber, thiamine, calcium, vitamin C, and vitamin D. It is concluded that not all basketball players have sufficient nutritional knowledge, and those who do, cannot reflect this knowledge very accurately on their nutritional habits. It will be better for wheelchair basketball players to receive nutritional education. More research is needed to make more accurate evaluations **of** the nutritional status of athletes with disabilities..

Keywords
Wheelchairs, Basketball, Anthropometry, Nutrition

INTRODUCTION

Adequate and balanced nutrition is very important for athletes to increase performance, prevent injuries, and recover quickly after competition and injuries. It is possible to meet the energy, carbohydrate, protein, fat requirement and fluid need of the athletes, which increase according to the sports branch, with adequate and balanced nutrition. While planning the optimal diet, the age, height, body weight, gender, sports branch, training frequency, training duration, and nutritional habits of the athlete should be taken into consideration. The main goal is to create a nutrition plan that will minimize the body deformations of amputee athletes. The energy requirements of disabled athletes are generally lower than those of other athletes (Krempien & Barr, 2011; Goosey-Tolfrey & Crosland, 2010). Considering the macro and micronutrient needs of athletes; since the training intensities between team athletes and their positions in the game will be different, there is a difference in carbohydrate requirements (Hawley, Dennis & Noakes, 1994). Compared to other athletes, although energy expenditure is lower, especially in wheelchairs, relative carbohydrate portions are similar (Price, 2010; Jung & Yamasaki, 2009). A diet rich in

Received: 25 January.2023 ; **Accepted:** 08 April 2023; **Online Published:** 18 April 2023
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How to cite this article: İslamoğlu, A.H., Ondar, E., Yıldırım, T. and Kartal, Z. (2023). Determination of Anthropometric Measurements and Nutritional Status of Wheelchair Basketball Players. *Int J Disabil Sports Health Sci*;2023;6(2):91-99. https://doi.org/10.33438/ijdshs.1242140

carbohydrates and fluid, recommended for athletes during recovery period, is also recommended for disabled athletes. An increase in protein requirement may occur among team athletes due to collisions and kicks during the competition, abrasions, and wounds in the body. It is argued that post-exercise protein use and requirement are similar to other athletes (Reddy, 2008; Lee et al., 2006). If the disabled athlete has a pressure wound, the need for protein may increase slightly and arginine is recommended for wound healing (Sherman & Barkley, 2011).

The recommended fat consumption level for team athletes is similar to the recommendation for all athletes (Fink, Burgoon & Mikesky, 2006). Dietary fiber intake is often insufficient in all persons with disabilities – whether they are athletes or not (Krempien & Barr, 2011; Goosey-Tolfrey & Crosland, 2010). Intestinal passage can take up to 80 hours in physically disabled individuals (Geders, Gaing, Bauman & Korsten, 1995); for this reason, a high fiber diet with adequate fluid intake is recommended to regulate bowel movements (Chung & Emmanuel, 2006). It is accepted that adequate and balanced nutrition alone does not guarantee the success of an athlete, but inadequate and unbalanced nutrition causes some health problems and poor performance (Özdemir, 2010). The aim of our study is to determine the anthropometric measurements, nutritional habits, and nutritional knowledge levels of wheelchair basketball players.

MATERIALS AND METHODS

Study Design

This cross-sectional study was planned and carried out with 40 basketball players from four professional wheelchair basketball teams in Wheelchair Super League between December 2021 and May 2022.

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Marmara University Faculty of Health Sciences Non-Invasive Clinical Research Ethics Committee; 25.11.2021/97. Written informed consent was obtained from all participants.

Data Collection

The data of the study were collected through a structured questionnaire via face-to-face interview method. The questionnaire consisted of open-ended and multiple-choice questions prepared by the researchers as a result of the literature review. In the general information part of the questionnaire, the basketball players were asked about their ages, clubs, educational and marital status. In the continuation of the questionnaire, various questions measuring the level of nutrition knowledge and nutritional habits were asked.

Anthropometric measurements and 24-hour food consumption records were taken by the researchers on the training days of the teams. Body weight, demi-span, and mid-upper arm circumference (MUAC) measurements of the basketball players were taken. The heights of the players were calculated by using the demi-span lengths with the help of the formulas in Table 1. Then, Body Mass Indices (BMI) of the basketball players were calculated.

Table 1. Estimated height calculation via demi-span length (Width and Reinhard, 2021)

Gender	Estimated Height (cm)
Female	1.35 x demi-span (cm) + 60.1
Male	1.40 x demi-span (cm) + 57.8

The study was started with 40 basketball players (4 females and 36 males), and the number of athletes decreased to 29 as there were losses during anthropometric measurements and food records.

Data Analysis

The data were evaluated statistically using the SPSS (Statistical Package for the Social Sciences) 21.0 package program. The Kolmogorov-Smirnov test was used to determine the conformity of the data to the normal distribution. Since the data were normally distributed, the relationship between variables was determined by the Pearson correlation test. The significance level was accepted as $p<0.05$.

The daily total energy and nutrient intake of basketball players was calculated with the Nutrition Information System (BeBiS 7.2) by using 24-hour food consumption records. With this program, in detail; energy, carbohydrate, protein, fat, fiber, vitamin D, vitamin C, calcium, magnesium, iron, total cholesterol, sodium,

potassium, vitamin B12, folic acid, and thiamine values of basketball players were examined.

RESULTS

Distribution of the sports clubs of the basketball players participating in the study were: 32.5% from Beşiktaş HDI Sigorta Wheelchair Basketball Team, 25% from 1907 Fenerbahçe Disabled Stars Basketball Team, 22.5% from Bağcılar Municipality Wheelchair Basketball Team, and 20% from Galatasaray Wheelchair Basketball Team. Ninety percent of players were male, 40% were married and most of the players (65%) had high-school education (not shown in table). Anthropometric measurements of basketball players are shown in Table 2.

Table 2. Anthropometric measurements of basketball players (n=29)

Parameters	Females			Males		
	Median	Min.-Max. Values		Median	Min-Max Values	
Body Weight (kg)	54	52	75	71	50	85.5
Estimated Body Height (cm)	157.3	155.9	160	176.8	157.2	190.8
Mid-Upper Arm Circumference (cm)	35	30.5	35.5	34	28	42
Demi-span Length (cm)	72	71	74	85	71	95
Body Mass Index (kg/m^2)	21.6	21.1	30.4	22.7	16.5	31.4

The answers given by the basketball players participating in the study to the questions about measuring their nutritional knowledge levels and nutritional habits were shown in Table 3.

Table 3. Answers of basketball players about their nutritional knowledge and nutritional habits (n=40)

Questions	Answers	n	%
Source of nutritional information*	Coach	14	35
	Nutrition books	5	12.5
	Media	18	47.5
	Insufficient	9	22.5
	Dietitian	1	2.5
	Unanswered	1	2.5
Meals that are usually skipped*	Breakfast	13	32.5
	Lunch	18	45
	Dinner	3	7.5
	None	7	17.5
Problems seen when breakfast is skipped*	Tiredness	6	15
	Weakness	12	30
	Attention deficit	4	10
	Do not skip	20	50
	Unanswered	1	2.5
Amount of liquid consumed before competition	< 0.5 L	16	40
	0.5-1 L	12	30
	1-2 L	7	17.5
	> 2 L	5	12.5
Kinds of food consumed before competition*	Carbohydrates	15	62.5
	Proteins	22	55
	Fats	6	15
	Vitamins	5	12.5
Mostly consumed liquids/beverages (except meals)*	Fruit juice	4	10
	Water	27	67.5
	Tea-Coffee	21	52.5
	Carbonated beverage	5	12.5
	Mineral water	15	37.5
Mostly consumed foods (except meals)*	Chocolate	17	42.5

	Toast	7	17.5
	Fruit	19	47.5
	Nuts	19	47.5
	Candy	2	5
	Sweets/Desserts	8	20
	Pastry	4	10
	Other	1	2.5
	Unanswered	1	2.5
Hours stop eating before competition	< 1 h	0	0
	1-2 h	14	35
	3-4 h	24	60
	Unanswered	2	5
Numbers of meals per day	1-2	23	57.5
	3-4	17	42.5
	5 and above	0	0
Defecation frequency	Everyday	15	37.5
	Every other day	11	27.5
	Every 3-4 days	4	10
	More than once a day	10	25
Relation between nutrition and basketball	No relationship	1	2.5
	Very closely related	33	82.5
	No idea	6	15
Amount of carbohydrate in sports drinks	None	1	2.5
	%1-2	3	7.5
	%4-8	0	0
	No idea	36	36
Nutrient contents targeted for consumption during the competition	Liquid, fiber and fat	0	
	Liquid and protein	17	42.5
	Liquid and carbohydrate	14	35
	No idea	9	22.5
Nutrient contents targeted for consumption after the competition	Protein, carbohydrate and fat	12	30
	Only protein	3	7.5
	Only carbohydrate	2	5
	Carbohydrate and protein	18	45
	No idea	5	12.5
Has these health complaints*	Thin nails	2	5
	Stains on nails	2	4
	Frequent cramps	8	17.5
	Tingling in hands and feet	4	10
	Getting tired quickly	4	10
	Cracks on the corners of the mouth	1	2.5
	Cold	7	17.5
	None	21	52.5
	Unanswered	1	2.5

*more than one option is marked, ***Correct answers are indicated in bold.***

Of all, 52.5% of basketball players find their knowledge about sports nutrition sufficient, 77.5% skip meals, 35% use tobacco, 90% pay attention to fluid intake during training, 62.5% think that they have adequate nutrition intake, 57.5% eat late at night, 35% use nutritional supplements, 37.5% consume energy drinks. While 72.5% of basketball players believe that vitamin supplements improve performance, only 37.5% use vitamin supplements (not shown in the table).

As a result of the analysis of 24-hour food consumption records of the basketball players participating in the study, the daily energy, nutrient intakes, and estimated average requirement (EAR/AR) values are shown in Table 4.

Table 4. Energy, nutrient intakes, and EAR values of basketball players (n=29)

Parameters	Median	Min. Value	Max. Value	EAR/AR[1]
Energy (kcal)	1967.68±847.1	721	4097.9	-[2]
Carbohydrate (g)	198.77±94.75	63.9	389.3	-
Protein (g)	78.79±49.23	17.8	252.4	45.56[3]
Fat (g)	94.59±47.64	11	248	-
Fiber (g)	20.96±12.99	4.7	59.3	25
Vitamin D (mcg)	5.54±11.49	0.1	61.5	10
Vitamin C (mg)	91.07±71.83	2.9	289.8	90
Calcium (mg)	749.72±357.11	199.9	1403.3	750-860[4]
Magnesium (mg)	276.23±157.36	79.3	765.8	-
Iron (mg)	11.45±5.25	3.7	26.1	6[5]
Total Cholesterol (mg)	434.45±287.92	92.4	1320.4	-
Sodium (mg)	3827.82±1792	824.6	8130.7	-
Potassium (mg)	2351.08±1321	445.9	5641	-
Cobalamin / Vitamin B_{12} (mcg)	5.94±5.59	0.6	30.9	-
Folic Acid / Vitamin B_9 (mcg)	310.16±167.89	45.7	766.8	250
Thiamine / Vitamin B_1 (mg)	0.88±0.64	0.2	3.4	1.0

[1] Estimated Average Requirement; [2] No EAR Value; [3] EAR value for protein intake is 0.66 g/kg/day.; [4] 19-24 ages: 860 mg, 25-50 ages: 750 mg.; [5] Premenopausal stage of women: 7 mg, for men: 6 mg.

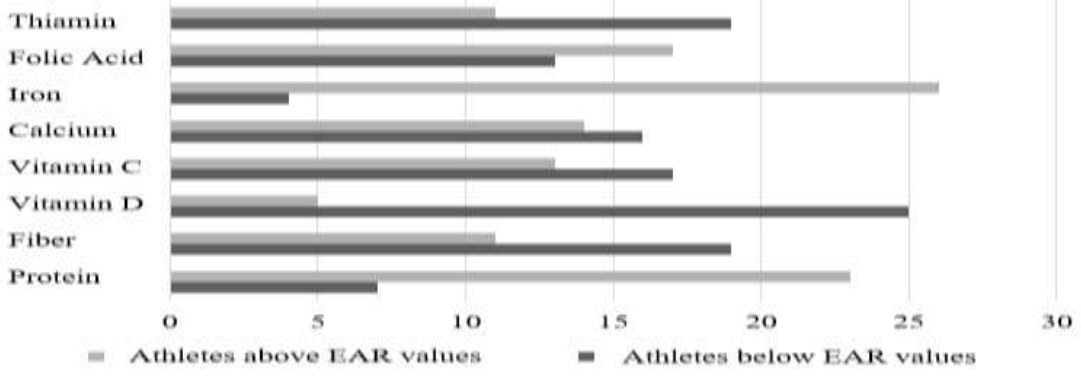

Figure 1. Figure 1. Comparison of the nutrient intakes of basketball players with the estimated average requirement (EAR/AR) values.

Figure 1 shows the comparison of the amount of nutrients taken by the athletes according to their food consumption records with the Estimated Average Requirement (EAR/AR) values (TÜBER, 2015). When the relationship between the MUAC and body weight of the basketball players and their energy and some nutrient intakes was examined, the relationship between body weight and MUAC was found to be statistically significant ($p<0.001$). The relationship between MUAC and energy, carbohydrate, protein, and fat intake were not significant ($p=0.444$, $p=0.438$, $p=0.925$, $p=0.437$, respectively).

DISCUSSION

Parameters such as body composition, ideal body weight, and BMI are important in every athlete group and are associated with performance. In a study, height and body weights were measured to calculate the BMI of 1,749 volunteer athletes participating in the paralympic games, and as a result, the prevalence of obesity was found to be

3.1 times higher than other athletes (Harris et al., 2003).

In a study of Latin American Special Olympics athletes, more than 40% of disabled athletes were found to be overweight and obese (Foley, Lloyd, Turner & Temple, 2017). The anthropometric measurements and the median values of BMI of the basketball players participating in our study were found to be within the normal range. In this context, they are not considered under the risk of obesity.

Inadequate and unbalanced nutrition is directly related to low performance in athletes (Ersoy, 2004). One of the aims of our study was to measure nutritional habits and nutritional knowledge levels of wheelchair basketball players. The numbers of basketball players who found their nutritional knowledge level sufficient and insufficient were found to be quite close to each other (52.5% and 42.5%, respectively). Although 82.5% of the basketball players in our study found sports and nutrition to be closely related, only 62.5% thought that they had adequate nutrition. This shows that there are shortcomings in the nutrition of the athletes. One of these shortcomings is that basketball players often skip meals that coincide with their training hours. For this reason, it was concluded that basketball players could not adjust their training times and meal times.

It has been determined that 40% of basketball players take less than 7 ml of fluid per kilogram before the competition. In order to prevent dehydration and regulate bowel movements in athletes, the recommended fluid intake is 5-7 ml/kg at least 4 hours before training and 3-5 ml/kg 2 hours before training (Chung & Emmanuel, 2006). Demirkan and colleagues emphasized that dehydration directly affects the performance of the athlete and that the habit of fluid intake should be gained by the athletes (Demirkan, Mitat & Kutlu, 2010). Sixty percent of the basketball players in our study answered as “3-4 hours ago”, 35% of them “1-2 hours ago” to the question “How many hours before the competition do you stop eating?”. The recommendation for athletes is to finish the main meal 3-4 hours before the competition. However, since the digestion is slower in wheelchair basketball players, it is recommended to extend this period (Schabort, Bosch, Weltan & Noakes, 1999).

It was determined that the content of the last food consumed by the majority of basketball players before the competition was carbohydrate (62.5%) and protein (55%). It is important for athletes to consume carbohydrate-rich foods before training. Wheelchair athletes have similar glycogen utilization as other athletes, but it has been reported that glycogen stores of disabled athletes are generally low at the beginning of exercise. For this reason, high carbohydrate intake before exercise is recommended for replenishing glycogen stores not to experience loss of performance (Goosey-Tolfrey & Crosland, 2010; Kreider et al., 2010). It was observed that basketball players in our study generally preferred foods with high simple carbohydrate content besides meals. A study has revealed that consumption of simple carbohydrates may cause movement restriction in wheelchair basketball players, as it causes fat accumulation around the waist (Grams, Garrido, Villacieros & Ferro, 2016). Although 35% of the basketball players gave the correct answer as "liquid and carbohydrate" to the question of what type of food the athletes aim to consume during the competition; no basketball player could give a correct answer to the question of how much carbohydrate the sports drinks contain. In a study examining the effect of sports drinks on performance; one group was given an 8% carbohydrate solution and the other group was given a placebo before the 20-minute arm-crank ergometer training. After all, the performance of the group that consumed 8% solution increased by 1 km (11.5 km vs. 12.5 km) (Spendiff & Campbell, 2002). When the athletes were asked which macronutrient(s) they aim to consume after the competition, 45% gave the correct answer by saying "carbohydrate and protein". Athletes need to consume a sufficient amount of carbohydrates in order to replenish glycogen stores and recover quickly after the competition. In addition, the protein consumed after the competition provides the amino acids necessary for the construction and repair of muscle tissue (Rodriguez, Di Marco & Langley, 2009).

The average energy intake of basketball players participating in the study was found to be 1967.68 kcal. The recommended intake for elite athletes with disabilities is 1500-2300 kcal on average (Krempien & Barr, 2011; Goosey-Tolfrey & Crosland, 2010). In this context, it is seen that the energy intake of the players participating in our

study is at a sufficient level. For muscle protein synthesis during the recovery period, if a sufficient amount of protein is not consumed, protein catabolism will overcome protein synthesis and this leads to loss of muscle mass and negative nitrogen balance (Wu, 2016). It is argued that post-exercise protein use and requirement are similar to those of non-disabled athletes. If the athlete has pressure wound, the need may increase a little more. The recommended amount of protein for elite athletes with disabilities is 1-1.5 g/kg/day (Lee et al., 2006). Twenty-three of the basketball players in our study have protein consumption above the recommended level. The recommended carbohydrate intake for disabled elite athletes is 3.4-4.4 g/kg/day (Price, 2010; Jung & Yamasaki, 2009). Similar to these recommendations, in a study investigating the nutritional status and supplement use of paralympic athletes, the average carbohydrate consumption of the participants was found to be 3.5 g/kg/day (Madden, Shearer & Parnell, 2017). Unlike the recommendations and similar studies, the average carbohydrate amount consumed by the basketball players participating in our study was determined as 2.87 g/kg/day. Adequate fiber intake is especially important for intestinal motility in wheelchair athletes because these athletes have a high incidence of constipation (Jeukendrup, 2017). The fiber intake of 19 basketball players in our study was found to be below the EAR value. It is recommended that the fat intake of disabled elite athletes should be between 28-37% of total energy (Krempien & Barr, 2011; Goosey-Tolfrey & Crosland, 2010). In a study investigating the nutritional status and nutritional knowledge levels of amputee wheelchair basketball players, it was determined that the athletes provided 44% of their daily energy needs from fat (Eskici & Ersoy, 2016). Similarly, the amount of fat consumed by the basketball players participating in our study was found to be 43% of the total energy. Considering the food records, it can be thought that the reasons for the high fat consumption may be the type of meat they consume was generally red meat, the consumption of nuts and oilseeds was high, and the carbohydrate deficit was completed from fat.

Athletes with disabilities cannot fully meet their vitamin and mineral needs with food. For this reason, the use of nutritional supplements is recommended for disabled athletes (Ersoy, 2004). Only 37.5% of the basketball players participating in our study use supplements. Appropriate intake and distribution of micronutrients in meals are very important to ensure the presence of substrates to regulate metabolic pathways and to modulate musculoskeletal adaptations caused by physical training (Close et al., 20016). For example, thiamine deficiency causes fatigue during exercise in athletes, while iron deficiency reduces hemoglobin level, leading to a decrease in performance capacity (Paker, 1996). For this reason, the health complaints (thin nails, frequent cramps, tingling in hands and feet, getting tired quickly, cracks on the corners of the mouth, cold, etc.) of the basketball players participating in our study made us think that the players may have had vitamin and mineral deficiencies. In Figure 1, the nutrient intakes of basketball players are compared with the estimated average requirement (EAR/AR). Among the reasons for the lack of various micronutrients in basketball players participating in the study; inadequate and/or unbalanced nutrition, incomplete use of supplements and especially low consumption of fresh vegetables and fruits can be shown.

In conclusion, it was determined that the median values of the anthropometric measurements of wheelchair basketball players were within the reference range. In addition, it has been observed that not all basketball players have sufficient nutritional knowledge and those who do cannot reflect this knowledge very accurately on their own nutritional habits. For this reason, it is recommended that it will be better for athletes to receive expert health support (such as nutrition education) in order to increase their nutritional knowledge, correct their unhealthy nutritional habits, enhance their performance, and minimize injuries. In addition, periodic health checks of the athletes (anthropometric and biochemical measurements) should be made and when a problem is detected, it should be solved with the help of experts before it worsens. There are very few comprehensive studies that determine the nutrient requirements of wheelchair basketball players, more research is needed to make more accurate evaluations for the athletes in this group.

Conflict of Interest

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

Ethics Statement

Ethical approval of the study was obtained from Marmara University Non-Interventional Clinical Research Ethics Committee at the board meeting dated 25.11.2021 (protocol number: 97). Written informed consent to participate in this study was provided by the participants.

Author Contributions

Study Design, AHİ; Data Collection, EÖ, TY, ZK; Statistical Analysis, AHİ, EÖ, TY, ZK; Data Interpretation, AHİ; Manuscript Preparation, AHİ, EÖ, TY, ZK; Literature Search, EÖ, TY, ZK. 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

Knowledge Level of Pelvic Floor and Pelvic Floor Disorders According to and Related Disorders According to Gender and Education Levels

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Abstract
Pelvic floor disorders, their management and protective educational programs have become popular in recent years. The aim of this study is to determine the level of knowledge about pelvic floor health according to gender and education levels. This cross sectional study is conducted on women and men between January and September of 2021 in Turkey. The knowledge level of pelvic floor was assessed with Pelvic Floor Health Knowledge Quiz (PFHKQ). Oneway ANOVA test was used for comparing pelvic floor knowledge according to the education levels and the age groups. Chi square test and Pearson chi square test were used for calculating binary variables, effect size, and confidence interval values between participants' pelvic floor knowledge level and gender. A total of 1215 (1115 women, 100 men) participants completed the study. Men had less knowledge about the topics related to the pelvic floor ($p < 0.05$) and the awareness of those that have graduated from higher education on these issues was found to be higher compared to the other education levels ($p<0.05$). In conclusion, we determined that the Turkish population has insufficient knowledge about the relationship between the pelvic floor and other body systems, the causes and types of pelvic problems. In the future, educational programs emphasizing deficient points regarding the pelvic floor within the scope of preventive treatment may be planned to cover the general population.

Keywords
Cardiovascular, Down Syndrome, Exercise, Physical Activity

INTRODUCTION

Pelvic floor consists of muscles, ligaments, and fascia; it is an important structure that supports the pelvic organs, provides control of micturition and defecation, and plays a role in the respiratory system, sexual function, and reproduction (Eickmeyer, 2017; Han & Ha, 2015; Messelink et al., 2005). The abnormal function of the pelvic floor is termed pelvic floor dysfunction and includes conditions such as Urinary incontinence (UI), Pelvic organ prolapse (POP), pelvic pain, sexual dysfunction, and anal incontinence (Good & Solomon, 2019; MacLennan, Taylor, Wilson, & Wilson, 2000). Conservative treatment and surgical intervention options are used in the treatment of pelvic floor dysfunctions. Delay of the treatment is associated with an increase in the burden of care and health expenditures and a deterioration in the quality of life (Duffield et al., 2017).

The level of patients' knowledge about pelvic floor health and the level of awareness about pelvic floor problems are important for preventive approaches. It has been shown that information and education programs about the pelvic floor lead to an increase in women's level of awareness (de Andrade et al., 2018; Geoffrion et

Received: 31 January.2023 ; **Accepted:** 14 April 2023; **Online Published:** 24 April 2023
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How to cite this article: Kılıç, B.B., Akgül, H., Timurtaş, E. and Özer, A.Y. (2023). Knowledge Level of Pelvic Floor and Pelvic Floor Disorders According to and Related Disorders According to Gender and Education Levels. *Int J Disabil Sports Health Sci*;6(2):100-110. https://doi.org/10.33438/ijdshs.1245528

al., 2009). On the other hand, in men, pelvic floor training is one of the treatment methods for pelvic floor disorders such as urinary incontinence after prostate treatment and erectile dysfunction (Ali et al., 2022; Cohen et al., 2016). For this reason, knowing the importance of the pelvic floor in both gender health can increase the chances of patients receiving effective treatment.

In researches conducted with different populations to determine the level of knowledge about the pelvic floor, it has been determined that the community has insufficient knowledge (de Freitas et al., 2019; Fante, Silva, Mateus-Vasconcelos, Ferreira, & Brito, 2019; Hill, McPhail, Wilson, & Berlach, 2017; Neels et al., 2016; Skaug, Engh, Frawley, & Bø, 2020). Although the number of studies conducted in this area is very limited in Turkey, the results show similarities with the results in the literature (Mamuk, Dişsiz, & Dinç, 2018; Süt & Küçükkaya, 2018). Patient education sessions are one of the most important ways of preventive health applications and the proportion of application increase day by day in Turkey.

To create a framework for guiding protective approaches in this area, we aimed to determine the level of knowledge of Turkish women and men about the pelvic floor and topics related to pelvic floor. We think that the results will obtain at the end of our study will provide up-to-date data on this subject. We hope that our results can be used in the design of preventive health policies.

MATERIALS AND METHODS

Study Design

This study was designed as a cross-sectional study. Ethical approval was obtained from the Scientific Research Ethical Committee of the Faculty of Health Science of Marmara University (Approval date and number: 28.01.2021/10). This study was conducted in accordance with the Declaration of Helsinki. This cross-sectional study was registered at the US National Institutes of Health (ClinicalTrials.gov) #NCT04893005.

Study Population

The volunteers who were invited via social media platforms (Facebook, Instagram) and accepted to participate the study were included. Exclusion criteria included participants who did not complete the entire quiz and were under 18.

Study Interventions

After receiving the informed consent electronically, firstly demographic data was examined. These data included age groups (18-25; 26-35; 36-45; 46-55; 56-65; >65), gender, education levels (elementary school, high school, graduate education, postgraduate education, doctorate education), birth experience, number of births, type of birth (vaginal delivery, cesarean section, epidural, water birth), and education/working status.

The general questions were determined to elicit the basic information level of the participants about the pelvic floor. The general question set is presented as the following;

- Have you ever heard the expression of ‘pelvic floor’ before?
- In which source have you encountered the expression of ‘pelvic floor’ before? (The answer options which were given to the participants for this question were television; lecture, online education, course; internet, social media; friends, family. And ‘others’ choice is also among the options).
- In the "Pelvic Floor Health Knowledge Quiz", which is a part of the same study, it was asked that pelvic floor location correctly on the body was given (Fig. 1).

And subsequently, the location of the pelvic floor was shown at PFHKQ correctly.

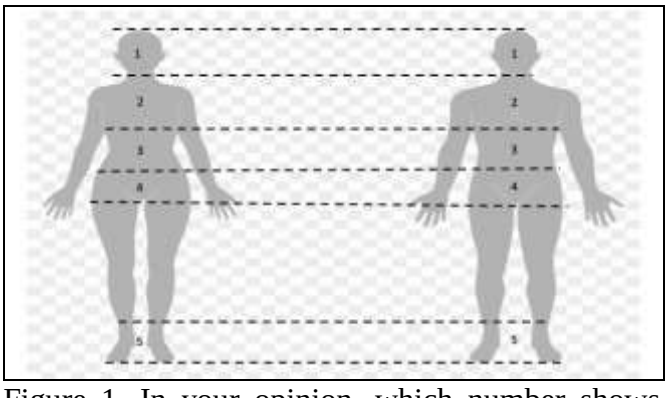

Figure 1. In your opinion, which number shows the pelvic floor location correctly on the body figure?

Pelvic Floor Health Knowledge Quiz

A special quiz consisting of 29 items that were previously developed and validated was used to determine the level of knowledge about pelvic floor function/dysfunction (items from 1 to 8), risk/etiology (items from 9 to 21) and diagnosis, and treatment (items from 22 to 29) (Wala'a & Çelenay, 2021). The participants were asked to

answer the items by choosing the appropriate option. The choices were ‘yes, no, do not know’. The answers were by allocating one point for each

question answered correctly, and zero points for answered incorrectly or to which the respondent does not know the answer. Higher scores show better knowledge.

At the end of the quiz, considering that the participants were asked which pelvic floor disorder they had. The options were ‘UI’, ‘POP’, ‘fecal incontinence’, ‘gas incontinence’, ‘pelvic pain’, and ‘none of them’.

Statistical Analysis

In the classification of the data, qualitative and quantitative statistical methods were evaluated with the SPSS 22.0 statistical program at the 95% confidence interval, and the significance was evaluated at the $p<0.05$ level.

The characteristics of the participants were summarized as frequencies for categorical data, means±standard deviation for continuous variables, and medians (quartiles), minimum, maximum values, and percentages were calculated for assessment. The total scores obtained from the quiz were determined as a percentage according to gender and education level. The answers given by the participants to the statements were categorized as correct or incorrect, and analyzes were made between groups according to age, gender, and education level. The Oneway ANOVA test was used to compare participants’ knowledge levels according to the age groups and education levels. Chi-square test and Pearson chi-square test were used for calculating binary variables, effect size, and confidence interval values between participants’ pelvic floor knowledge level and gender. Cramer’s V test was used to detect the measure of association between two nominal variables.

RESULTS

A total of 1215 people, (1115 women, and 100 men), were included in the study (Fig. 2).

The age groups that participated the most in the research were 46-55 and 56-65 (27.1%, and 27.7%, respectively). It was determined that 73.8% of the participants had a graduate or higher education level, and 21.2% had continued health education and worked in medical fields. 72.2% of the participants had birth experience. All participants' sociodemographic statuses are shown in Table 1.

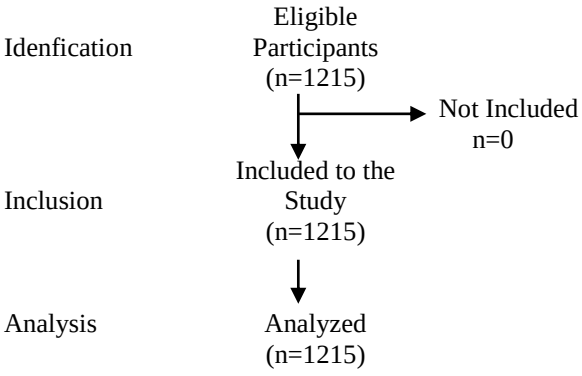

Figure 2. Study enrolment flow chart. STROBE, Strengthening the reporting of observational studies in epidemiology

Table 1. Sample Characteristics

		n(%)
Age groups (years)	18-25	143(11,8)
	26-35	146(12)
	36-45	198(16,3)
	46-55	329(27,1)
	56-65	336(27,7)
	>65	63(5,2)
Gender	Female	1115(91,8)
	Male	100(8,2)
Education Level	Elementary School	19(1,6)
	High School	299(24,6)
	Graduate	718(59,1)
	Postgraduate	134(11)
	Doctorate	45(3,7)
Birth Experience	Yes	811(72,7)
	No	304(27,3)
Number of Births	1	329(40,6)
	2	416(51,3)
	3 and more	66(8,1)
Education/Work in a medical field	Yes	256(21,1)
	No	959(78,9)

52.7% of the participants had heard the expression ‘pelvic floor’ before. The participants stated that they encountered the term 'pelvic floor' mostly through lecture-online education-course, and internet-social media (42.2%, 28.4%, respectively). 72.8% of the participants showed the location of the pelvic floor correctly.

When the situation of the participants regarding pelvic floor disorders was examined, it

was determined that 25.7% of the participants had UI, 4.7% had POP, and 13.7% had pelvic pain.

Participants generally correctly agreed that:

- In pelvic floor problems, besides the clinical examination, the patient's complaint is also important (79,4%)
- The patient examination is important in determining pelvic floor problems (79,2%)
- Regular physical activity and exercise are beneficial for pelvic floor problems (71,4 %).

When the total correct scores obtained from the quiz were examined, it was seen that 9.2% of the men and 90.8% of the women scored 20 or more points out of a 29-point total; 23% of men, and 9.96% of women got 0 points. When the total scores obtained are analyzed according to their education levels, of the participants received 0 points, 15.79% had elementary school education, 16.72% had high school education, 10.72% had graduate education, and 2.96% had postgraduate education. Of the participants who received 20 or more points out of a 29-point total, 23.16% had high school education, 56.3% had graduate education, 15.07% had postgraduate education, and 5.51% had doctorate education. None of the participants who had a doctorate education received 0 points, and none of the participants who had an elementary school education received 29 points.

There was no difference between the correct answers according to the age groups (p>0.05).

Participants' knowledge of the pelvic floor function/dysfunction; risk/etiology; diagnosis and treatment were compared according to gender (Table 2).

Table 2. The Effect of gender on the level of knowledge of the pelvic flor

		Female n(%)	Male n(%)	p	CI (lower-upper)	Crammer's V
Item 1. Urinary incontinence is a pelvic floor problem	Correct	783(70.2)	51(51)	**<0.0001***	2.27 (1.50-3.42)	**0.114**
	Incorrect	332(29.8)	49(49)			
Item 2. Pelvic organ (bladder, uterus, bowel) prolapse is one of the pelvic floor problems	Correct	823(73,8)	54(54)	**<0.0001***	2.40 (1.59-3.64)	**0.122**
	Incorrect	292(26,2)	46(46)			
Item 3. Fecal or gas incontinence is not a pelvic floor problem	Correct	303(27,2)	14(14)	0.074	0,68 (0,45-1,04)	0,051
	Incorrect	812(72,8)	86(86)			
Item 4. Pelvic floor tension may be the cause of pelvic pain (pain in the pelvis)	Correct	641(57,5)	56(56)	0,773	1,60 (0,70-1,61)	0,008
	Incorrect	474(42,5)	44(44)			
Item 5. Pelvic floor problems are not associated with low back pain	Correct	182(16,3)	18(18)	0,631	1,11 (0,72-1,73)	0,014
	Incorrect	933(83,7)	82(82)			
Item 6. The pelvic floor is important for sexual health	Correct	724(64,9)	59(59)	0,235	1,29 (0,85-1,95)	0,034
	Incorrect	391(35,1)	41(41)			
Item 7. The pelvic floor is associated with the respiratory system	Correct	112(10)	19(19)	**0,006***	0,48 (0,28-081)	**0,079**
	Incorrect	1003(90)	81(81)			
Item 8. Pelvic floor weakness can cause pelvic pain	Correct	643(57,7)	58(58)	0,949	0,97 (0,65-1,49)	0,002
	Incorrect	472(42,3)	42(42)			
Item 9. Pelvic floor problems can have many causes	Correct	778(69,8)	66(66)	0,432	1,19 (0,77-1,83)	0,023
	Incorrect	337(30,2)	34(34)			
Item 10. Pregnancy can adversely affect the pelvic floor	Correct	675(60,5)	46(46)	**0,005***	1,80 (1,19-2,71)	**0,081**
	Incorrect	440(39,5)	54(54)			
Item 11. Having vaginal birth too many times can weaken the pelvic floor	Correct	631(56,6)	33(33)	**<0.0001***	2,65 (1,72-4,08)	**0,13**
	Incorrect	484(43,4)	67(67)			
Item 12. The probability of pelvic floor problems is low in obese individuals	Correct	38(3,4)	4(4)	0,447	1,17 (0,78-1,77)	0,022
	Incorrect	1077(96,6)	96(96)			

Item 13. Smoking addiction can weaken the pelvic floor	Correct	336(30,1)	31(31)	0,857	0,96 (0,62-1,50)	0,005
	Incorrect	779(69,9)	69(69)			
Item 14. Weight-bearing continuously can damage the pelvic floor	Correct	697(62,5)	58(58)	0,373	1,21 (0,80-1,83)	0,026
	Incorrect	418(37,5)	42(42)			
Item 15. Constipation can cause weakening of the pelvic floor	Correct	503(45,1)	45(45)	0,983	1,01 (0,67-1,52)	0,001
	Incorrect	612(54,9)	55(55)			
Item 16. Pelvic floor problems are more common in younger people than older people	Correct	66(5,9)	8(8)	0,072	1,47 (0,96-2,24)	0,052
	Incorrect	1049(94,1)	92(92)			
Item 17. Unconsciously compelling sports/exercises (such as jumping, or lifting weights) can weaken the pelvic floor	Correct	448(40,2)	34(34)	0,226	1,30 (0,85-2,01)	0,035
	Incorrect	667(59,8)	66(66)			
Item 18. The postural disorder does not affect the pelvic floor	Correct	139(12,5)	11(11)	0,372	0,83 (0,55-1,26)	0,026
	Incorrect	976(87,5)	89(89)			
Item 19. Menopause can affect pelvic floor problems	Correct	570(51,1)	40(40)	**0,033***	1,57 (1,03-2,39)	**0,061**
	Incorrect	545(48,9)	60(60)			
Item 20. Some medications can cause pelvic floor problems	Correct	410(36,8)	40(40)	0,522	0,87 (0,57-1,33)	0,018
	Incorrect	705(63,2)	60(60)			
Item 21. Surgical approaches to the pelvic organs (bladder, prostate gland, uterus...) can weaken the pelvic floor	Correct	469(42,1)	43(43)	0,856	0,96(0,64-1,46)	0,005
	Incorrect	646(57,9)	57(57)			
Item 22. The patient examination is important in determining pelvic floor problems	Correct	894(80,2)	68(68)	**0,004***	1,90 (1,22-2,97)	**0,082**
	Incorrect	221(19,8)	32(32)			
Item 23. Some special tests are used to identify pelvic floor problems	Correct	513(46)	54(54)	0,443	0,85 (0,57-1,28)	0,022
	Incorrect	602(54)	46(46)			
Item 24. In pelvic floor problems, besides the clinical examination, the patient's complaint is also important	Correct	899(80,6)	66(66)	**0,001***	2,14 (1,38-3,33)	**0,099**
	Incorrect	216(19,4)	34(34)			
Item 25. Pelvic floor exercises can prevent pelvic floor problems	Correct	786(70,5)	59(59)	**0,017***	1,66 (1,09-2,52)	**0,069**
	Incorrect	329(29,5)	41(41)			
Item 26. Physiotherapy can be used to treat pelvic floor problems	Correct	517(46,4)	53(53)	0,203	0,77 (0,51-1,16)	0,037
	Incorrect	598(53,6)	47(47)			
Item 27. Medication is the only treatment for pelvic floor problems	Correct	24(2,2)	1(1)	0,972	1,01 (0,67-1,52)	0,001
	Incorrect	1091(97,8)	99(99)			
Item 28. Surgery may not be the definitive solution for pelvic floor problems	Correct	465(41,7)	43(43)	0,801	0,95 (0,63-1,43)	0,007
	Incorrect	650(58,3)	57(57)			
Item 29. Regular physical activity and exercise are beneficial for pelvic floor problems	Correct	802(71,9)	66(66)	0,209	1,32 (0,86-2,04)	0,036
	Incorrect	313(28,1)	34(34)			

CI: Confidence Interval; *p<0,05

Function/Dysfunction:

In both the 1st item (Urinary incontinence is a pelvic floor problem) (95% CI 1.50-3.42, Crammer's V= 0.114, p<0.0001) and the 2nd item (Pelvic organ (bladder, uterus, bowel) prolapse is one of the pelvic floor problems) (95% CI 1.59-3.64, Crammer's V= 0.122, p<0.0001), it was found that females' knowledge levels were significantly higher than males'. But the males' knowledge level was higher than the females' for the 7th item (the pelvic floor is associated with the respiratory system) (95% CI 0.28-0.81, Crammer's V= 0.079, p=0.006). Other items' answers associated with this section were similar.

Risk/Etiology:

A statistically significant difference was found according to the genders. In the 10th (Pregnancy can adversely affect the pelvic floor) (95% CI 1.19-2.71, Crammer's V= 0.081, p=0.005), 11th (Having vaginal birth too many times can weaken the pelvic floor) (95% CI 1.72-4.08, Crammer's V= 0.13, p<0.0001), and 19th items (Menopause can affect pelvic floor problems) (95% CI 1.03-2.39, Crammer's V= 0.061, p=0.033), it was determined that females' correct answers were higher than males'.

Diagnosis and Treatment:

Females' knowledge rates about the diagnosis and treatment of the pelvic floor problems which are involved in the 22nd (Patient examination is important in determining pelvic floor problems) (95% CI 1.22-2.97, Crammer's V= 0.082, p=0.004), 24th (In pelvic floor problems, besides the clinical examination, the patient's complaint is also important) (95% CI 1.38-3.33, Crammer's V= 0.099, p=0.001), and 25th items (Pelvic floor exercises can prevent pelvic floor problems) (95% CI 1.09-2.52, Crammer's V= 0.069, p=0.017) were higher than males'. The other results were similar.

Participants' knowledge of pelvic floor function/dysfunction; risk/etiology; diagnosis and treatment were compared according to their education levels (Supplement 1).

The correct answers rate of the participants who had graduate, postgraduate, and doctorate education were higher than the participants who had an elementary school and high school education for the 2nd (Pelvic organ (bladder, uterus, bowel) prolapse is one of the pelvic floor problems), 6th (The pelvic floor is important in sexual health), 10th (Pregnancy can adversely affect the pelvic floor), 11th (Having vaginal birth too many times can weaken the pelvic floor), 12th (The probability of pelvic floor problems is low in obese individuals), 27th (Medication is the only treatment for pelvic floor problems), 28th (Surgery may not be the definitive solution for pelvic floor problems), 29th items (Regular physical activity and exercise are helpful for pelvic floor problems); (p<0.05). The correct response rate of the participants who had elementary school education was found to be lower than that of the other groups for the 9th item (Pelvic floor problems can have many causes); (p<0.05).

The rate of correct answers of the participants who had graduate and higher education were similar for the 1st (Urinary incontinence is a pelvic floor problem), 3rd (Fecal or gas incontinence is not a pelvic floor problem), 5th (Pelvic floor problems are not associated with low back pain), 6th (The pelvic floor is important in sexual health), 7th (The pelvic floor is associated with the respiratory system), 8th (Pelvic floor weakness can cause pelvic pain), 9th (Pelvic floor problems can have many causes), 10th (Pregnancy can adversely affect the pelvic floor), 12th (The probability of pelvic floor problems is low in obese individuals), 14th (Weight bearing continuously can damage the pelvic floor), 15th (Constipation can cause weakening of the pelvic floor), 18th (Postural disorder does not affect the pelvic floor), and 21st items (Surgical approaches to the pelvic organs (bladder, prostate gland, uterus...) can weaken the pelvic floor); (p>0.05). For the 23rd (Some special tests are used to identify pelvic floor problems) and 26th items (Physiotherapy can be used to treat pelvic floor problems), the correct response rates of the participants who had postgraduate and doctorate education were higher than the participants who had high school and graduate education (p<0.05). Lastly, the correct response rates for all of the items were similar among participants who had postgraduate and doctorate education.

No statistically significant difference was found according to the education levels for the correct answers of the 4th (Pelvic floor tension may be the cause of pelvic pain (a pain in the pelvis)), 7th (The pelvic floor is associated with the respiratory system), 8th (Pelvic floor weakness can cause pelvic pain), 13th (Smoking addiction can weaken the pelvic floor), 17th (Unconsciously compelling sports/exercise (such as jumping, lifting weights) can weaken the pelvic floor), and 24th items (In pelvic floor problems, besides the clinical examination, the patient's complaint is also important); (p>0.05).

DISCUSSION

As a result of our research, it was determined that men had less knowledge about the topics related to pelvic floor function/dysfunction, risk/etiology, diagnosis and treatment, and the awareness of those that have graduated from higher education was found to be higher. In the

statements evaluating the level of knowledge, it was remarkable that about a quarter of men and about 1 in 10 women knew nothing.

Having basic knowledge about the functioning of organs and systems enables people to apply to the right specialist without loss of time in the presence of any health problem and paves the way for early intervention of the disease. In recent years, research on the pelvic floor has drawn attention to the role of training programs on pelvic floor health and exercises in reducing the symptoms of patients, increasing their knowledge level and quality of life (Berzuk & Shay, 2015; Blanchard, Nyangoh-Timoh, Fritel, Fauconnier, & Pizzoferrato, 2021). In the literature, there are different results in studies investigating the level of knowledge about the anatomical location and function of the pelvic floor in different population groups. Blanchard et al. (Blanchard et al., 2021), reported that only 15.2% of women knew the location of the pelvic floor correctly before pelvic floor muscle training. de Freitas et al. (de Freitas et al., 2019), reported that only 24.1% of 133 women participants over the age of 18 had accurate information about the location of the pelvic floor. In a study by Neels et al. (Neels et al., 2016), the rate of knowing the location of the pelvic floor accurately was reported as 92%. In this study, it was seen that 74.1% of women and 59% of men had correct information about the anatomical location of the pelvic floor. The fact that the studies were conducted in different sample sizes and groups may be the reason for the differences in the results.

Pelvic floor dysfunctions can be hidden due to the feeling of shame in society. Wala'a and Çelenay (Wala'a & Çelenay, 2021), found that 23.5% of 370 participants felt shame due to pelvic floor problems. The fact that the individuals think of pelvic floor problems as a natural consequence of pregnancy, old age, and menopause, and in addition to this, not sharing their problems with health professionals due to the feeling of shame reduces the success of preventive health practices. This situation can also prevent patients from accessing information about the existence of different treatment methods. Only 13% of our participants stated that they heard the pelvic floor expression from friends and family; 77.2% of them reported that they heard it through television, lectures/online education, the internet, and social media. The results support that this issue is not talked about much even among individuals of the same sex in society. This situation can also be attributed to the cultural characteristics of Turkish society. Individuals can be informed about the pelvic floor by implementing training programs containing accurate information, especially through television, the internet, and social media. This situation can positively affect the individual and the health system in terms of early treatment, preventive health services, and health care costs.

The prevalence of UI varies between 23% and 70% in the literature (Arbuckle, Parden, Hoover, Griffin, & Richter, 2019; Kim, Lee, & Park, 2004; Perera, Kirthinanda, Wijeratne, & Wickramarachchi, 2014). The studies conducted in Turkey have shown that the rate of UI in women varies between 5.65% and 56.7% (Akkus & Pinar, 2016; Demir, Sen, Irer, Bozkurt, & Esen, 2017; Öztürk, Toprak, & Basa, 2012; Şimşek & Yağcı, 2022). Wala'a and Çelenay (Wala'a & Çelenay, 2021), reported that POP is seen in 3.5% of men and women over the age of 18. Yıldız et al. (Yıldız, Çakmak, Gencer, & Boyama, 2018) detected POP as 66.2% in perimenopausal women. In our study, it was determined that 25.7% of our participants had UI and 4.7% had POP. 77% of men and 53.9% of women stated that they did not have any pelvic floor problems. Our findings are in agreement with the literature. Pelvic floor disorders are common, especially in women (MacLennan et al., 2000). We think that women have a higher level of knowledge as a result of the fact that these problems are more common in women. In our study, it was determined that women had a higher level of knowledge on items related to UI and POP, which questioned the knowledge of the participants about pelvic organ dysfunction.

Fante et al. (Fante et al., 2019), reported in a systematic review that women could not identify risk factors for pelvic floor dysfunction. On the other hand, Hill et al. (Hill et al., 2017), found that pregnant women who attended antenatal education classes had a higher level of pelvic floor awareness. In our study, we found that women gave more correct answers than men, especially for items stating that pregnancy, vaginal delivery, and menopause are risk factors. We think that the reason why women have more information about these risk factors than men may be because these processes are a part of female physiology. 72.7% of our female participants gave birth; 48.89%

reported that they had experienced of vaginal delivery. One of the reasons why women had a higher level of knowledge than men in our study may be that they received information about risk factors in pelvic floor dysfunctions in pregnancy and birth preparation training and books during pregnancy and childbirth. Moreover, this research showed that the most of women and a low range of men, and also persons who had high education levels, had got a score of 20 and above from the PFHKQ. A 20-point is not a cut of value for this scale. On the other hand, it can be said that is a high knowledge level according to the total score because higher scores show better knowledge for the PFHKQ. Moreover in a study, Mamuk et al. (2022), reported that students who perceived a high level of knowledge about pelvic floor health also had significantly higher sub-scales scores (18 points for PFHKQ scale total score) in the pelvic floor functions and dysfunctions as well as pelvic floor dysfunction's etiology and risk factors. Our results showed that the pelvic floor health knowledge levels of participants, who are women with and high education level, were higher than the others. It can be said that this is an expected result according to the literature.

Exercise practices are important in pelvic floor problems. Among these applications, pelvic floor muscle training provides an improvement in symptoms in the presence of UI and POP in women (Li, Gong, & Wang, 2016; Woodley et al., 2020). In men, the effectiveness of pelvic floor muscle training in the treatment of erectile dysfunction and premature ejaculation has been demonstrated (Myers & Smith, 2019). Skaug et al. (Skaug et al., 2020) reported that in athletes 43% of women and 72.5% of men did not know how to train their pelvic floor muscles. In studies conducted in Turkey, while Mamuk et al. (Mamuk et al., 2018), reported that 91.1% of women working in the field of health had knowledge about pelvic floor muscle exercise; Kahyaoglu et al. (Süt & Küçükkaya, 2018) reported that 16.5% of 559 patients had knowledge about pelvic floor muscle exercise. 71.4% of the participants in our study reported that regular physical activity and exercise were beneficial for pelvic floor problems. In addition, 70.9% of women and 59% of men stated that exercise can prevent pelvic floor problems. Since our research was planned online, the knowledge level of the participants about pelvic floor exercise practices and exercises could not be questioned in detail. It can be considered as one of the limitations of this research.

The pelvic floor is important for sexual health in both sexes. In the literature, there are studies investigating the level of knowledge about sexual health in Turkey. Aydın Sayılan and Özbaş (Aydın Sayılan & Özbaş, 2018) determined that 4.2% of graduate students started to learn information about sexual health during their university years. Koluacik et al. (Koluaçık, 2010) reported that the knowledge level of sexual and reproductive health increased as age and grades progressed. These studies support our conclusion that those with graduate or higher education have more knowledge about the relationship between the pelvic floor and sexual health. The low level of knowledge of our participants those with elementary and high school education may be due to deficiencies in the education curricula. In Turkey, education on the reproductive system is given in the 7th grade at the elementary education level and in the 11th grade at the high school level. We think that adding basic information about the pelvic floor, sexual health, and reproductive health to these training programs in accordance with the age levels will be beneficial in terms of raising awareness in this area in general.

The strength of our study is that the level of knowledge of the pelvic floor in Turkey is questioned in both genders and all education levels.

As a result it was determined that the participants had insufficient knowledge about the relationship of the pelvic floor with other body systems, the causes, and types of pelvic problems. We think that these points may be included in the content of the education programs to be planned within the scope of preventive interventions. In addition, it can be beneficial to design the education programs according to the participants' education level, to reach the goals. In further studies, the evaluation of the knowledge level of participants including more men can be investigated and which interventions can effectively increase their pelvic floor knowledge level can also be investigated.

Acknowledgement

We thank participants for contributing to the study.

Disclosure Statement

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

Funding

The authors received no financial support for the research.

Author Contribution

BBK conceived and designed the study, and conducted the research. Material preparation and data collection were performed by, HA and ET. AYÖ performed the data analysis and statistical interpretation and wrote part of the results section. The first draft of the manuscript was written by BBK and all authors commented on previous versions of the manuscript. All the authors have critically reviewed and approved the final draft and are responsible for the content.

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

RESEARCH ARTICLE

Caregiving Children with Visually Impairments: Occupational Balance and Quality of Life Perspective

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Abstract
Several studies have shown that caregivers of children (COC) with special needs have their occupational balance (OB) or quality of life (QOL) worsening. However, the OB and QOL of COC with visual impairment are not adequately investigated. Fifty-nine participants who were the primary COC who were diagnosed with either low vision (LV) or blindness completed the study. Occupational Balance Questionerrie Turkish version and the WHO Quality of Life Scale-Short Form Turkish version were applied. The correlation analysis was used to test the correlation between the OB and QOL scores. The Mann-Whitney U used for comparing OB and QOL scores between the COC with LV and blindness. There was a positive correlation between caregivers' OB and QOL (r=0.600; p>0.05). There was no statistically significant difference between OB and QOL of the two groups of caregivers (p>0.05). There are many issues that occupational therapists should support and investigate about this family. We think that the quality of life, balance of activity and efficient use of the time of COC with VI should be further investigated by occupational therapists.

Keywords
Occupational Balance, Quality of Life, Children With VI, Caregiver

INTRODUCTION

Visual impairment (VI) is caused by various diseases or degenerative conditions and leads to significant limitations in vision that cannot be corrected by conventional methods (Elgendy, Sik-Lanyi, & Kelemen, 2019). According to the World Health Organisation (WHO), 285 million people worldwide have VI due to both eye diseases and uncorrected refractive errors, while seven million children have VI. Ten million children have correctable refractive errors (bilateral visual acuity <6/18), and about 1.4 million children have blindness (WHO, 2022).

In childhood, the motor, cognitive and psychosocial development of children with LV can be affected (Rainey, Elsman, van Nispen, van Leeuwen, & van Rens, 2016). In addition, the visual function may affect children's daily living activities, academic skills, participation in leisure time, and socialization activities (Lupón, Armayones, & Cardona, 2018). These difficulties faced by children with LV affect the quality of life (QOL) not only of the child but also of all family members (Lupón, Armayones, & Cardona, 2018; Rainey et al., 2016).

Caregivers of children with special needs are faced with role changes that affect their

Received: 18 February.2023 ; **Accepted:** 28 April 2023; **Online Published:** 01 May 2023
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How to cite this article: Güney Yılmaz, G., Abaoğlu, H., Demirok, T. and Akı, E. (2023). Caregiving Children with Visually Impairments: Ocupational Balance and Quality of Life Perspective. *Int J Disabil Sports Health Sci*;6(2):111-118. https://doi.org/10.33438/ijdshs.1252793

personal lives, social interactions, expectations, plans, and work experiences. This role changes lead to many problems affecting caregivers' QOL and well-being (Kuo et al., 2011; Van Cleave, 2015). Lupón et al. stated that caregivers' quality of life is negatively affected, and low quality of life is associated with psychosocial well-being (Lupón et al., 2018).

The term occupational balance (OB), which is frequently used by occupational therapists, has been defined as the subjective experience of having the right number of occupations and the correct variation between occupations in the occupational pattern (Güney Yılmaz, Avcı, & Akı, 2022; Wagman, Håkansson, & Björklund, 2012). Several studies have shown that COC with special needs have their OBs worsening. In addition, the time allocated by these individuals for themselves has decreased depending on the burden of care (Engelen, 2017; McGuire, Crowe, Law, VanLeit, & Health, 2004). A consensus has emerged that engaging in various occupations in a sufficient and satisfying pattern in line with life roles improves health and well-being and reduces stress (Anlaby, Jarus, Backman, & Zumbo, 2010). A good OB leads to a healthy life and supports well-being (Bejerholm, 2010). Wagman and Hakanson stated that the deterioration or decrease in OB might be related to individuals' QOL (Wagman & Håkansson, 2014a).

Factors such as QOL, caregiver burden, and parental stress of COC with visual impairment have been examined in the literature (Kantipuly et al., 2019; Kuriakose, Khan, Almeida, & Braich, 2017; Lupón et al., 2018). However, the OB and QOL of COC with visual impairment are not adequately investigated in the literature. Also, it has not been investigated how caregiving for children with LV and VI affects QOL or OB. This study aims to examine the relationship between the OB and QOL of COC with VI and to compare the OB and QOL between COC with LV and blindness.

MATERIALS AND METHODS

Participants

The study was completed with 59 participants who were the primary COC under the age of 18 who were diagnosed with either LV or blindness. Illiterate persons and those who did not voluntarily accept participation in the study were excluded from the study.

The 59 parents in this study consisted of 45 mothers and 14 fathers. The mean parental age was 34.3 (± 5.85) years, and the mean age of the children was 5.4 (±3.32) years. Thirty-four of the children had LV, and 25 had a diagnosis of blindness. While 43 of the caregivers were not working at any job, 16 caregivers were working while continuing to caregiving. While only 14 caregivers received support in caring for children, 45 participants undertook caregiving alone. Parent and child characteristics are summarised in Table 1.

Procedure

The sampling of the study was formed by the COC with visual impairment who were previously followed up in the Hacettepe University Faculty of Health Sciences Occupational Therapy Department. The invitations containing the research content were sent online to the caregivers. The questionnaire forms and family consent of the families who accepted to participate were created with Google Forms and sent to the families via e-messages such as e-mail and other online messaging services. Demographic information forms, Occupational Balance Questionerrie Turkish version (OBQ11-T), and World Health Organization Quality of Life Scale-Short Form Turkish version (WHOQOL-BREF TR) were applied to the individuals participating in the study. Evaluations were conducted with individuals through social networks and phone calls due to the pandemic. The study was approved by the local institutional ethical board (Hacettepe University Non-Interventional Clinical Research Ethics Committee, (registration number GO 20/1093).

Instruments: Participant characteristics

Demographic information form:

A form containing the age, gender, VI, and demographic information of the caregivers such as age, gender, educational status, employment status, and relationship level was applied. In addition, it was asked whether they were giving care to another individual and whether they received support from another person in caregiving.

Instruments: Quality of Life

WHOQOL-BREF TR:

The Turkish version of WHOQOL-BREF TR consists of 27 items, while the original version of the scale consists of 26 items (Eser et al., 1999). The scale includes, general health status (GH); Physical Health (PH); Mental Health (MH), Social relations (SE); Environmental Health (EH) subtests. Each item is scored on a 5-point Likert scale. The scale also includes two items consisting of QOL and general health items. WHOQOL BREF TR is calculated over 20 points. The raw scores are converted to percentages. A high score on the scale indicates a high QOL (Eser et al., 1999; Whoqol Group.,1998).

Table 1. Participant characteristics of children (N=59).

	M (SD)	Range
Age of Children (years)	5.4±3.32	0-15
Caregivers' Age (years)	34.3± 5.85	26-56
	Frequency (%)	
	Low Vision (n=34)	**Blind (N=25)**
Gender: Children		
Male	14 (%41.2)	18 (%72)
Female	20 (%58.8)	7 (%28)
Caregiver gender		
Female	31(%91.2)	14 (%56)
Male	3(8.8)	11 (%44)
Kinship with the child		
Mother	31(%91.2)	14 (%56)
Father	3(8.8)	11 (%44)
Caregiver education level		
Primary school	5 (%14.1)	9 (%36)
Middle School	7 (%20.6)	3 (%12)
High school	11 (%32.4)	8 (%32)
University	11 (%32.4)	5 (%20)
Caregiver work status		
Working	7 (%20.6)	9 (%36)
Not working	27 (%79.4)	16 (%64)
Secondary diagnoses coexisting with VI (such as CP, autism, ADHD)		
Yes	19 (%55.9)	8 (%32)
No	15 (%44.1)	17 (%68)
Support during caregiving		
Yes	4 (%11.8)	10(%40)
No	30 (%88.2)	15 (%60)
Does the child attend school?		
Yes	11 (%32.4)	15 (%60)
No	23 (%67.6)	10 (%40)

M: mean; SD: standard deviation. VI: Visual Impairments; CP: Cerebral Palsy; ADHD: Attention-deficit/hyperactivity disorder

Instruments: Occupational Balance

OBQ11-T:

It is a scale that measures the OB of an individual. The purpose of the scale is to measure satisfaction according to the amount and variety of daily occupations of the individual and to describe the OB according to the results obtained (Wagman & Håkansson, 2014b). A Turkish validity and reliability study was conducted for the 11-item version of the test with 0.922 test and retest coefficient and 0.785 Cronbach alpha (Günal et al., 2020). Each item in the scale is scored on a 4-point Likert scale (0-3) between "absolutely disagree" and "absolutely agree". The total score ranges from 0 to 33 by summing up item scores, with higher

Data analyses

All analyses were performed using the Statistical Package for the Social Sciences (SPSS) software version 23. Descriptive statistics, including frequency, percentage, median, and minimum/maximum values, mean, and standard deviation were used. The normality of the distribution was analyzed by the Kolmogorov-Smirnov test. Since the data were non-normally distributed, the Spearman correlation analysis was

utilized to test the correlation between the OB and the COC with LV and blindness. Although there is no cut-off value for OBQ, the higher score obtained from the test increases the OB level (Günal et al., 2019). Therefore, the raw score was used to interpret the OB scores of the families.

RESULTS

OB of Caregivers

The caregivers' mean score for the OBQ11-T was 12.37 ± 6.70. While this average was 13.02 ±6.9 for COC with LV, it was 11.48±6.43 for COC with blindness. Statistically significant difference comparing OB and the QOL scores between QOL scores. The Mann-Whitney U used for between the OB of the two groups of caregivers couldn't found (p>0.05) (Table 2).

QOL of Caregivers

While the median percentage value of the caregivers' WHOQOL total percentage score was 50.00, GH was 50.00; PH was 53.57; MH was 54.16; SH was 50.00; EH was 46.87 (Table 3). While statistically significant differences in GH scores between COC with LV and blindness (p <0.05); there were no significant differences between PH, MH, SH, EH, and T scores (p> 0.05) (Table 2).

Table 2. Difference between the OB and QOL scores of caregivers of children with low vision and children with blindness

	Low Vision (N=34)		Blind (N=25)		Mean difference (MWU)	
	Mean/SD	*Median Min-Max*	*Mean/SD*	*Median Min-Max*	*Z*	*p*
OBQ11-T:	13.02±6. 9		11.48±6.43		-.845	0.398
WHOQOL-GH (%)		50 25-100		50 0-87.50	-2.033	0.042*
WHOQOL-PH (%)		60.71 17.86-100		50 21.43-92.86	-1.39	0.164
WHOQOL-MH (%)		56.25 16.67-95.83		54.16 8.33-87.50	-.555	0.579
WHOQOL-SH (%)		50 0-100		50 0-91.67	-.857	0.391
WHOQOL-EH (%)		48.43 9.38-93.75		46.87 0-90.63	-1.316	0.188
WHOQOL-T (%)		56.01 20.37-93.52		48.14 11.11-87.04	-1.029	0.303

p<0.05*; p<0.001**; Max: Maximum; Min: Minimum; MWU: Mann Whitney U Test; OBQ11-T: Occupational Balance Questionerrie; SD=Standard Deviation; WHOQOL: World Health Organization Quality of Life Scale Short Form. GH: General Health. PH: Physical Health. MH: Mental Health. SH: Social Health. EH: Environmental Health. T: Total Score

The Relationship Between QOL and OB of Caregivers

Positive correlation between caregivers' OB and QOL was found. There were high correlation between OBQ11-T and WHOQOL-T (r=0.600); moderate between GH (r=0.586), PH (r=0.537), MH (r=0.524), EH (r=0.529); low correlation was found between SH (r=0.342). The correlations were statistically significant (p<0.05) (Table 3).

Table 3. Relationship between the OB and the QOL of caregivers of children with visual impairments

N=59	OBQ11-T **Mean/SD (12.37±6.70)**		
	Median (IQR)	**p**	**r**
1. WHOQOL-GH	50.00 (25.00)	0.001***	0.586
2. WHOQOL-PH	53.57 (25.00)	0.001***	0.537
3. WHOQOL-MH	54.16 (20.83)	0.001***	0.524
4. WHOQOL-SH	50.00 (33.33)	0.008**	0.342
5. WHOQOL-EH	46.87 (31.25)	0.001***	0.529
6. WHOQOL-T	50.00 (21.30)	0.001***	0.600

*p<0.05; **p<0.01; ***p<0.001; r: Spearman Correlation Coefficient; IQR: Inter Quartile Range; OBQ11-T: Occupational Balance Questionerrie; SD=Standard Deviation; WHOQOL: World Health Organization Quality of Life Scale Short Form. GH: General Health. PH: Physical Health. MH: Mental Health. SH: Social Health. EH: Environmental Health. T: Total Score

DISCUSSION

The main finding of the study is that there is a relationship between the QOL and OB of COC with VI.

In this study, we found that the OB of COC with VI correlated with the caregivers' total score and general health, physical health, mental health, social health, and environmental health scores of WHOQOL-BREF. A good OB and time use may be determinants of health and well-being. Caring for a visually impaired child may require different responsibilities than caring for other children with special needs. It has been reported that the difficulties experienced by COC with VI, in particular, are enormous, and sometimes the difficulties encountered are beyond the coping capacity of their families. Also, most parents of visually impaired children need financial resources to provide their children with a better standard of living (Ya-Otto, Tobias, & Mashego-Brown, 2018). In this study, few caregivers were working in paid job. It can lead to increased financial support needs for maintenance. This situation may have restricted the caregivers, who already have limited financial resources, from participating in occupations such as taking hobbies or participating in social activities. In a different dimension, employment is a fundamental element of an adult's life and not only generates income but also provides a sense of participation, role definition, and physical and mental stimulation (Wanberg, 2012). It has been shown that limitations in participating in productive activities can have a significant and negative impact on the overall quality of life (Extreme, & Rey, 2014).

Caring for a child with visual impairment may involve different needs. Some studies have shown that care needs and burnout may increase depending on the child's vision level. It was stated that as the vision level of the child decreases, the need for support in daily life may increase, and the physical activity level of the child may decrease (Braich, Lal, Hollands, & Almeida, 2012; Perkins, Columna, Lieberman, Bailey, 2013). However, Houwen et al. stated that children's gross motor skill levels and physical capacities are not related to their visual level (Houwen et al., 2007). This may suggest that children's physical support needs in daily life are independent of their visual level. In this study, it was found that there was no statistically significant difference between the COC with blindness and LV both in their QOL Total and OB. However, in further studies, grouping children according to their visual acuity levels and comparing the OB and QOL of the caregivers can enable us to see the effect of vision more clearly.

Another finding of the study is that the OB scores of the caregivers are relatively low. Donovan et al. (2005) stated that families of children with special needs were isolated from activities involving social contact, and therefore

they had difficulty coping with their emotional burden (Donovan, VanLeit, Crowe, & Keefe, 2005). Dalvand et al. reported that COC with cerebral palsy had difficulties in participating in personal care and leisure time activities and coping with this process during the long rehabilitation period (Dalvand et al., 2015). Sola-Carmona et al. stated that the well-being of caregivers with children affected by visual impairment is negatively related to reduced leisure time participation (Sola-Carmona et al., 2016). Barrozo et al. stated that caring for a visually impaired person leads to losses or changes in professional roles, especially among working caregivers. It showed important results such as changes in the life routines and roles of the caregiving process (Barrozo, Rubo Nobre, & de Cássia Into Montilha, 2015). There may be factors affecting the OB levels of the caregiver's children with VI and that may require to support from other caregivers. The child's lack of vision and the need for support in daily life may cause the parent to devote most of his time and activities to his child. Caregivers who feel the need to constantly monitor and protect their children at home or in the social environment may have difficulty spending time for themselves. Even if children's levels of physical independence and participation in activities of daily living are high, environments outside the home are particularly fraught with risks for children with VI. Even if the child can go out alone, unfortunately, the accessibility resources to the social environment are insufficient. Therefore, families often have to be with their children in all situations. For this reason, caregivers may often use their time to continue and be with their children, rather than devoting their time to different activities that may be valuable to them.

Another finding of the study was that the quality of life levels of caregivers was at low levels. It was determined that the quality of life score was at the level of 50 percent by the caregivers at both the total level and in the subtests. There is growing research interest in the quality of life of parents of children with VI. However, different opinions have been put forward on what affects the quality of life of these caregivers. The relationship between the severity of visual impairment or the presence of comorbidities and its impact on the family remains controversial, and there are inconsistent results in published literature (Lupón, Armayones, & Cardona, 2018). Some authors conclude that both factors have a negative impact, while others emphasize comorbidity rather than the true severity of VI (Sola-Carmona et al., 2016; Tröster, 2001). Again, some studies have stated that factors such as care burden, burnout, and stress negatively affect the quality of life of these individuals (Fathizadeh et al., 2012; Speedwell et al., 2003). Based on the data of this study, we think that the quality of life of individuals may have also been affected by their occupational imbalances. A good and balanced daily life cycle can increase the well-being of individuals and support the habits of a quality and healthy life. We think that the quality of life, balance of activity and efficient use of the time of COC with VI should be further investigated by occupational therapists.

Key Findings

This study is the first to evaluate the relationship between the QOL and OB of COC with VI. The findings of the study revealed the support needs of these caregivers. These caregivers, which are rarely mentioned in the literature and sometimes assume the role of being the eyes of their children, have distinct needs like their children. We think that there are many issues that occupational therapists should support and investigate about the families such as lifestyle changes, OB education and time management.

Limitations

Data were collected with a survey method in a local region of Turkey, collecting data from different locations could offer a different perspective. In addition, the global COVID-19 pandemic at the time of the evaluations may have affected the answers of the families. Another limitation was the inability to compare the QOL and OB according to children's functional vision levels.

Acknowledgments

The authors would like to thank all the families who participated in this study.

Statement of contributorship

All authors contributed to the development of the study methodology, data collection and analysis. All authors participated in writing, reviewing and editing the manuscript, and approved the final version.

Conflict of interest

The authors declare that there is no conflict of interest.

Ethics Committee

The study was approved by the local institutional ethical board (Hacettepe University Non-Interventional Clinical Research Ethics Committee, (registration number GO 20/1093) and conducted in consideration of Helsinki's Declaration principles.

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

RESEARCH ARTICLE

Investigation of the Effects of Physical Activity Level on Posture, Depression and Sleep Quality in University Students

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Abstract
University years are a critical period for physical activity, which has physical, mental, and social benefits throughout life. This study aimed to understand how the posture, depression, and sleep quality levels of university students with different physical activity levels are affected and to emphasize the importance of interventions that increase physical activity levels. Our study included 366 students from Ankara Medipol University who were studying in 2022-2023 and agreed to participate in our study. Postures of students; with Posture Screen Mobile, physical activity levels; with the International Physical Activity Questionnaire (IPAQ), depression levels; with the Beck Depression Inventory (BDI), and Sleep quality; with the Sleep Quality Scale and Sleep Variables Questionnaire (SQS-SVS) were evaluated. According to the results obtained from the study, when the beck depression inventory scores of the students were compared according to their physical activity levels, there was a difference in favor of the physically active group ($p<0.05$), while no difference was found in the sleep quality scale scores ($p>0.05$). No difference was observed between the groups when the posture disorders were compared according to the student's physical activity levels ($p>0.05$). When university students were classified according to different physical activity levels, it was determined that sleep quality and posture disorders did not change, while depression levels were positively affected as activity levels increased. Directing students to physical activities and evaluating their posture and directing them to necessary activities is essential.

Keywords
University Students, Posture, Physical Activity, Depression

INTRODUCTION

It is known that physical activity, which is defined as any bodily movement that occurs with the contraction of skeletal muscles and requires energy expenditure above the basal level, increases the satisfaction level of individuals in every period of life and increases the ability to fight against the problems that may be encountered (Piggin, 2020). University years are when individuals try to complete their development and maturation quickly and try to learn the professions they will continue throughout their lives. During this period, individuals may reduce their social and physical activities, primarily due to academic success concerns (Kohl and Cook, 2013).

Received: 10 February.2023 ; **Accepted:** 28 April 2023; **Online Published:** 06 May 2023
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How to cite this article: Bulguroğlu, H.I., Bulguroğlu, M., Gevrek Aslan, C., Zorlu, S., Dinçer, S. and Kendal, K. (2023). Investigation of the Effects of Physical Activity Level on Posture, Depression and Sleep Quality in University Students. *Int J Disabil Sports Health Sci*;2023;6(2):119-128. https://doi.org/10.33438/ijdshs.1249625

However, studies report that social and physical activities to be done during the university period will positively contribute to the academic success of the individual and his post-university life (Lipošek et al. 2018). The most important benefit of physical activities during university is permanent habits. Studies show that individuals who start physical activities during their university years or continue to do so in this period try to continue activities throughout their lives. This will allow individuals to continue the benefits of physical activity throughout their lives (Carballo-Fazanes et al. 2020).

One of the essential contributions of physical activity to individuals during the university period is the support it provides to the physical development of individuals (Pan et al. 2022). Deterioration in posture may not only affect the physiological processes of individuals but also lead to mental and social negativities (Nair et al. 2015). As it is known, physical activity supports the mental and spiritual development of the individual as well as the physical development of the individual and ensures that the sense of satisfaction he can get from life is maximized (Gill et al. 2013). In addition, physical activity supports individuals to have better sleep quality. Quality sleep can depend on many factors. However, providing adequate daily physical activity is essential in quality sleep strategies. Good sleep is vital for individuals to have fewer depressive symptoms and maintain life satisfaction by providing the energy required for the next day. In addition, studies show that sleep quality is affected by postural changes (Wunsch et al. 2017).

A lifestyle with low levels of physical activity will negatively affect individuals in every sense. Staying away from activities, especially during the university years, which we call young adults, can negatively affect posture and cause many problems in students, primarily pain and external appearance. It may cause an increase in students' social isolation and depressive symptoms and reduce their quality of life (Tigli et al. 2020). Therefore, directing students to activities during their university years is a mission of universities. In this context, many universities today give importance to social and sportive performance as much as academic performance. With various organizations and school clubs, students are tried to be directed to physical and social activities (Foubert and Urbanski, 2006).

Studies in the literature show that students' mood and sleep quality are negatively affected by both the pandemic and the technological processes, and physical activity decreases. (Merellano-Navarro et al. 2022; Pelucio et al. 2022; López-Valenciano et al. 2021). All these processes will naturally affect the postures of the students negatively. Today, the relationship between health and physical activity is getting stronger. Although the relationship between studies and physical activity, depression, and quality of life has been discussed, the limitations of these studies are the small sample size and methodological inadequacy (Pearce et al. 2022; de Oliveira et al. 2019; Slimani et al. 2020). In addition, only one study examines the correlation between physical activity and posture, which is important for healthy development, especially for young adults during their university years (Fernani et al. 2017). Only one hundred people were included in this study, which only gave information about the concavity of the lumbar region with the evaluation method used in posture analysis.

Based on all these studies, different physical activity levels may affect university students' postures, mental states, and sleep quality. This study aims to examine how posture, depression, and sleep quality affect university students with different physical activity levels and emphasize the importance of interventions that increase physical activity levels.

MATERIALS AND METHODS

Study design and population

Our study, planned as a cross-sectional research, included 366 volunteer students between the ages of 18-30, with a BMI between 18-30 and not using any medication, who was educated at Ankara Medipol University in 2022-2023, who agreed to participate in the study. Individuals with neurological or chronic systemic diseases, sleep apnea, or diagnosed psychiatric disorders, individuals with a history of trauma in the last six months, and individuals who had undergone musculoskeletal surgery were not included in the study. Before starting the study, Ankara Medipol University Non-Interventional Clinical Research Ethics Committee approval was obtained (Date: 18/10/2022 Decision No: 0174). Before the study, all individuals were informed about the study, and an 'Informed Consent Form' was signed. Participants in the study were evaluated by mobile

application and filled out data collection questionnaires. Our study was conducted in accordance with the Principles of the Declaration of Helsinki.

Measuring methods

The individuals included in the study were evaluated in face-to-face interviews. The data was recorded by mobile application and questionnaire forms. Demographic (name-surname, age, height) information of the individuals was obtained. In addition, their posture, physical activity levels, depression levels and sleep quality were evaluated. Measurements were made during the non-exam period.

In our study, posture was evaluated with "Posture Screen Mobile (PSM)" (posture analysis/body composition/motion assessment software). PSM is an application developed and proven to evaluate posture with the help of a camera system on mobile devices (Hopkins, 2014). Photographs of the participants are taken from the front, back, right, and left, wearing appropriate clothes, with their upper body and knees open, without predetermining reference points on the person. The photographs taken are evaluated by determining the anatomical reference points on the photograph with PSM. According to these marked points, it is calculated as the degree of deviation from the normal posture for each individual through the software. The degrees of each individual's anterior (frontal plane), posterior (frontal plane), and right and left lateral (sagittal plane) posture disorders are reported by the PSM.

The International Physical Activity Questionnaire (IPAQ) was used in our study (Lee et al. 2011). The Turkish version of the questionnaire consisting of seven questions covering the time spent in activities in the last seven days, was used in our study (Sağlam et al. 2010). The questionnaire defines individuals as physically inactive (<600 MET-min/week), low physical activity levels (600 – 3000 MET-min/week), and sufficient physical activity levels (>3000 MET-min/week).

The Beck Depression Scale (BDI) was used to measure the mental health levels of individuals (Beck et al. 1961). In BDI, a 21-item self-evaluation type scale, items are evaluated on a scale ranging from zero to three depending on the severity of their symptoms. The score range is 0-63. The Turkish version of the BDI questionnaire was used in our study (Hisli et al. 1989). The Cronbach's alpha value of this study, which was 0.858, was 0.74 in Hisli's validity and reliability study.

The Sleep Quality Scale and Sleep Variables Questionnaire (Meijer and van den Wittenboer 2004), used to evaluate the sleep quality of individuals, includes seven scale items measuring sleep quality and eight items describing parental control, total sleep duration, midpoint, and effectiveness. In our study, only the sleep quality part of the scale was used. The scores that can be obtained from the sleep quality scale range from 7 to 21, while high scores indicate poor sleep and low scores indicate good sleep. The Turkish version of the Questionnaire was used in our study (Önder et al. 2016). The Turkish version of the Questionnaire was used in our study (Önder et al. 2016). The scale's Cronbach Alpha internal consistency coefficient for seven items measuring sleep quality was determined as 0.77, and that of this study was 0.791.

Statistical analyses

Statistical analyzes of the study were performed using the “Statistical Package for Social Sciences” (SPSS) version 21.0 (SPSS inc. Chicago, IL, USA). Visual (histogram, probability graphs) and analytical methods (Kolomogrov-Smirnov/Shapiro-Wilk's test) were used to define whether the variables were normally distributed. Customarily distributed numerical variables will be shown as mean±standard deviation, and non-normally distributed variables will be shown as the median. The Kruskal-Wallis Test was used for more than two groups for intergroup comparisons of numerical data that did not fit the normal distribution. In cases where there was a difference due to this test, the groups were compared in pairs using the Mann-Whitney U test to determine the difference. One-way ANOVA and post hoc analyzes were used to compare more than two groups in cases with normal distribution. Chi-square analysis was performed for categorical data in the evaluation between groups. Spearman correlation analysis was used to determine the relationship between continuous variables.

RESULTS

In our study, which included 366 volunteer university students, 95 participants were inactive, 173 had low, and 98 had sufficient physical activity levels. Age, BMI, gender, and smoking status of individuals according to their physical activity levels are given in Table 1. While no difference was observed in terms of age, BMI, and gender according to the physical activity level groups (p>0.05, Table 1), there was a significant difference in smoking in the physically inactive group (p<0.05, Table 1).

Table 1. Demographic characteristics of students by physical activity levels

		Physical Activity Level			p
		Physically Inactive Median (IQR) (n=95)	**Low Physical Activity Level Median (IQR) (n=173)**	**Physical Activity Level Sufficient Median (IQR) (n=98)**	
Age (years)		20 (18-24)	20 (18-29)	20 (18-25)	0.459[a]
BMI (kg/m^2)		20,44 (18.22-29.87)	22,01 (18.53-26.86)	22,15 (18.07-29.80)	0.110[a]
Gender n(%)	**Female**	78 (82.1)	139 (80.3)	84 (85.7)	0.384[b]
	Male	17 (17.9)	34 (19.7)	14 (14.3)	
Smoking n(%)	**Yes**	41 (43.2)	46 (26.6)	20 (20.4)	**0.001**[b]
	No	54 (56.8)	127 (73.4)	78 (79.6)	

*p < 0.05, m: meter, kg: kilogram, BKI: body mass index, a: Kruskal Wallis Test, b: Chi-Square Test.

When the results of the assessment methods used in the study were correlated with each other, a significant negative correlation was observed between IPAQ and Beck Depression Inventory and between Beck Depression Inventory and Sleep Quality Scale Scores (p<0.05 Table 2). A significant positive correlation was observed between the degree of posterior postural disorder and the degree of anterior postural disorder and between the degree of right posture disorder and left postural disorder (p<0.05, Table 2).

Table 2. Correlation between the scale scores

	IPAQ		SQSS		BDI		DOAPD (◦)		DOPPD (◦)		DORPD (◦)		DOLPD (◦)	
	r	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**R**	**p**
IPAQ	-	-	0.037	0.486	-0.14	**0.005***	0.070	0.180	-0.01	0.755	-0.01	0.979	-0.12	0.813
SQSS	0,03	0.486	-	-	-0.35	**0.001***	0.031	0.553	0.06	0.185	0.04	0.378	0.03	0.525
BDI	-0.14	**0,005***	-0.36	**0.001***	-	-	-0.02	0.617	0.07	0.172	-0.01	0.871	-0.01	0.843
DOAPD (◦)	0.07	0.180	0.03	0.553	-0.02	0.617	-	-	0.33	**0.001***	0.03	0.511	0.03	0.553
DOPPD (◦)	-0.01	0.755	0.06	0.185	0.07	0.172	0.33	**0.001***	-	-	0.01	0.807	0.03	0.565
DORPD (◦)	-0.00	0.979	0.04	0.378	-0.01	0.871	0.03	0.511	0.01	0.807	-	-	0.50	**0.001***
DOLPD (◦)	-0.12	0.813	0.03	0.525	-0.01	0.843	0.03	0.553	0.03	0.565	0.50	**0.001***	-	-

Spearman correlation analysis, *p < 0.05, r: correlation coefficient, IPAQ: International Physical Activity Questionnaire, SQSS:Sleep Quality Scale Scores, BDI: Beck Depression Inventory, DOAPD: Degree of anterior posture disorder, DOPPD: Degree of posterior posture disorder, DORPD: Degree of right posture disorder, DOLPD: Degree of left posture disorder

When the beck depression inventory scores of the students were compared according to their physical activity levels, a difference was found in favor of the physically active group ($p<0.05$, Table 3). No difference was found when the Sleep Quality Scale Scores were compared according to the student's physical activity levels ($p>0.05$, Table 3). When the posture disorders of the students were compared according to their physical activity levels, no significant difference was observed between the groups to any degree ($p>0.05$, Table 4).

Table 3. Comparison of depression and sleep quality according to students' physical activity level

	Physical Activity Level			
	Physically Inactive Median (IQR) (n=95)	**Low Physical Activity Level Median (IQR) (n=173)**	**Physical Activity Level Sufficient Median (IQR) (n=98)**	**p**
Beck Depression Inventory	14 (0-52)	13 (0-48)	11 (0-49)	**0.034***
Sleep Quality Scale Scores	15 (8-20)	15 (8-21)	15 (7-21)	0.940

Kruskal Wallis Test, *p < 0.05

Table 4. Comparison of postures according to students' physical activity levels

	Physical Activity Level				
	Physically Inactive X ± SD (n=95)	**Low Physical Activity Level X ± SD (n=173)**	**Physical Activity Level Sufficient X ± SD (n=98)**	**p**	**f**
Degree of anterior posture disorder (◦)	6.00±3.47	6.24±3.27	6.31±3.98	0.807	0.214
Degree of posterior posture disorder (◦)	23.92±10.29	23.21±10.70	23.03±9.71	0.811	0.210
Degree of right posture disorder (◦)	28.87±10.09	28.06±9.12	27.93±8.05	0.730	0.315
Degree of left posture disorder (◦)	25.55±9.58	24.17±9.43	25.17±8.83	0.460	0.779

One way anova test, X ± SD: Mean ± Standart Deviation

DISCUSSION

In conclusion, this study aimed to examine how the posture, depression, and sleep quality levels of university students with different physical activity levels are affected and to underline the importance of interventions that increase physical activity levels. When the university students participating in our study were categorized according to their physical activities, it was observed that the individuals with sufficient physical activity levels smoked the least.

Similar to our study, studies in the literature have shown that an increase in the activity level of university students helps to stay away from harmful habits. (Romaguera et al. 2011; Alaraja et al. 2018; Kuloglu, 2023). It has been said that one of the essential keys to a healthy life is physical activity. It has been stated that individuals try to reduce their harmful habits, such as smoking, to increase the benefits of physical activity. Similar to the literature, our study found the least smoking in students with higher physical activity levels. We think this result is due to the student's desire to increase the benefits of physical activity, which is one of the critical investments they make in themselves.

Our study observed a negative correlation between the BDI and the total scores of IPAQ and SQSS.

Similar to the result of our study, many studies have shown that depression levels are associated with physical activity (Xiang et al. 2020; Luo et al. 2022; Coughenour et al. 2021). Also, there is a relationship between depression level and the sleep quality of individuals (Iyigun et al. 2017; Ozkan et al. 2015). It increases self-confidence in individuals thanks to both the physical and mental benefits that physical activity provides. It provides the power to cope with negative thoughts, especially with the self-confidence it provides; in this case, it helps individuals to increase their mood levels. Thus, a decrease in depressive levels is achieved (Zamani Sani et al. 2016; Legey et al. 2017). Likewise, individuals experience vicious cycles related to depression and sleep—the decreased sleep duration and quality cause the individual to start the next day in a lower mood. A person in a depressive state cannot have a good sleep pattern (Oginska and Pokorski, 2006). On the contrary, if individuals have good sleep quality, they can struggle more easily with the problems they encounter during the day. If the individual has fewer depressive symptoms, he/she can sleep more comfortably and efficiently at night (Raniti et al. 2017).

Our study observed a relationship between anterior postural disorder and posterior postural disorder and between right posture disorder and left posture disorder. It is known that the anterior, posterior, right, and left postures are interrelated, and the posture consists of complementary structures (Carini et al. 2017; Ferreira et al. 2011) Anterior-posterior and right-left postures are on the same axis in themselves. Therefore, if a disorder is observed in the anterior, it will also have a consequence in the posterior. Similarly, if a disorder is observed on the right side, it will also result on the left side. As seen at the end of our study, good posture will include the harmony of all parts of the body with each other.

When the students in our study were classified according to their physical activity levels, a statistically significant difference was observed between the BDI results. Similarly, studies have reported that a decrease in physical activity levels in students negatively affects depression levels. On the contrary, increased physical activity positively affects depression (Bulguroglu et al. 2021; Talapko et al. 2021). Physical activity plays a crucial role in individuals' struggles with depression. The developments that occur in the body of individuals with physical activity provide physical and mental development in individuals. Both mental and physical development will positively affect the individual's life. They will facilitate the removal of depressive symptoms (Legey et al. 2017). The statistical significance of our study was obtained from the fact that the depression level of the group with sufficient physical activity level was lower. Although the depression levels of our students in our study were not high, we think that the most crucial reason why it was lower in the group with sufficient physical activity level was the physical development provided by physical activity. College years are the young adult years of students. In these years, individuals especially attach importance to their external appearance. This encourages students to participate in physical activity (Egli et al. 2011). Thus, through orientation to physical activity, students gain other benefits and the physical benefits of physical activity. One of these benefits is their academic achievement. Studies have shown that physically active students are also academically successful (Fox et al. 2010). In addition, with the self-confidence it provides, students can make more explicit decisions and avoid negative emotions (Xiang, et al. 2020). We think that all these reduce the level of depression in university students with sufficient physical activity levels.

When the students in our study were classified according to their physical activity levels, no statistically significant difference was found between the Sleep Quality Scale Scores.

In the literature, different results are observed with our study. Studies show that, especially with the decrease in physical activity levels of university students, their sleep quality deteriorates (Memon et al. 2021; Ghrouz et al. 2019). We think the most critical difference between our results and those observed in other studies stems from the questionnaire we used. Although the Sleep Quality Scale Scores, which we used in our study, were used to measure sleep quality, the more detailed questions of the Pittsburg sleep quality scale and the more detailed scoring of the results may make it more useful, especially in the population without serious sleep problems. In addition, studies show that the sleep quality problems observed in university students are primarily due to physical problems such as

staying in dormitories, bed problems, or living in crowded environments (Orzech et al. 2011). The fact that we did not question the physical environment in which the students live may have paved the way for this result. All these situations may have caused us to find differences in our study's sleep quality levels in students with different physical activity levels.

When the students in our study were classified according to their physical activity levels, no statistically significant difference was found between all posture disorder results.

Although postural disorders of students are not classified according to different physical activity levels in the literature, it has been shown that many postural disorders may occur with a decrease in physical activity levels (Wyszyńska et al. 2016; Kiers et al. 2013). We think that their disorders are not affected because they did not perform physical activity in the presence of a specialist. Posture disorders are problems that can occur in any plane, especially in young adulthood, which are essential for individuals throughout their lives (Grimes, P., & Legg, S). Specialists should evaluate posture disorders, and individuals should be given physical activities specific to their disorders. Physical activities, in general, will not be effective in postural disorders and may cause disorders of individuals to be adversely affected. For these reasons, students with posture disorders should be referred to a specialist. The increase in the physical activities of university students will make them feel stronger and more confident. It will positively affect many parameters of their education and later life, especially their depressive symptoms.

Although we did not find a statistical difference in students with different physical activity levels in our study, we know from studies in the literature that physical activity is effective in the management of sleep problems and better postural development (Wyszyńska et al. 2016; Kiers et al. 2013; Memon et al. 2021; Ghrouz et al. 2019). We health professionals should emphasize the importance of the physical activity to all individuals in society, especially university students, and direct them to physical activity to increase their self-confidence and purify them from depressive thoughts. In addition, as in all their lives, the students' postures should be evaluated in detail in these periods, and each student should be directed to physical activity for their disorders. A limitation of our study is that we did not question the menstrual cycle, which may affect women's mood levels at the time of measurement.

Conclusion

Health professionals should draw attention to the importance of physical activity in every part of society at every opportunity and direct them to physical activity. The importance of doing physical activity and staying active in order to gain healthy habits, especially at university age, was once again emphasized in this study.

As a result, our study will guide the literature that it is essential to direct university students to various physical activities. That posture disorders that may occur in students during orientation to these activities should be evaluated and directed to activities suitable for their disorders. Furthermore, future studies could investigate the long-term effects of physical activity on university students' mental and physical health, as well as the relationship between physical activity, sleep quality, and postural disorders.

In conclusion, this study highlights the need for interventions to increase physical activity levels among university students and emphasizes the importance of physical activity in maintaining mental health and well-being.

Declaration of Conflicting Interests

All authors declare no conflicts of interest.

Funding

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

Ethics Statement

The study protocol was approved by Ankara Medipol University Non-Interventional Clinical Research Ethics Committee (18/10/2022 Decision No: 0174) and written informed consent was obtained from the participants before starting the study.

Author Contributions

Study Design, HIB, MB; Data Collection, CGA, SZ, SD, KK; Statistical Analysis, CSG; Data Interpretation, HIB; Manuscript Preparation, HIB; Literature Search, MB. 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

Does Function Level of Individuals With Autism Spectrum Disorder Affect The Family Impact?

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Abstract
The aim of our study is to examine the effect of differences in the levels of functionality of individuals with autism spectrum disorder (ASD) on level of family involvement.Our study has been carried out with the relatives of ASD individuals attending Aydın Efeler Municipality Autism Sports and Life Center. The Pediatric Functional Independence Criterion (WeeFIM) has been used to determine the functional independence levels of children, and The Family Impact Scale (FIS) has been used to measure the impact on the families of children with chronic disabilities. Our study was completed with the assessment of 98 individuals diagnosed with ASD (age=10.17±5.11, gender=15 female/83 male) and 98 pairs of their parents. The total WeeFim score was determined as 94.73 ±20.26 (independent) and the family impact scale scores were determined as 63.03 ± 12. The correlation analysis showed the sub WeeFIM impact the financial burden my family, self-care, communication, social status were statistically significant and weak correlation score between the total score ($p<0.05$; respectively, r=-0.025, r=-0.027, r=-0.310, r=-0.273). There was also a statistically significant, negative and moderate correlation between the total impact score of the FIS and the social status of the WeeFIM ($p<0.00$; r=-0.402).This study shows that family influence on individuals with ASD affects their social status. In addition, self-care, communication skills, and social status negatively affect individuals with more financial problems. In families with individuals with ASD, the independence of children affects the quality of life of families.

Keywords
Autism Spectrum Disorder, Impact on the Family, Parents, Financial stress, Social communication

INTRODUCTION

The incidence of autism spectrum disorder (ASD) has increased significantly worldwide recently. Increasing awareness and advances in diagnosis are some of the reasons for the increase in this rate (WHO, 2018; Ulu and Karacasu, 2022). Although the incidence of ASD is statistically stated as 1 in 160 (Keogh et al., 2019), and even in less developed countries, these rates assumed to be higher due to the exact prevelence in not known. ASD is defined as a neuro-developmental disorder in which brain function is affected. It is a wide-spectrum disorder affecting social communication, characterized by limited attention, repetitive involuntary movements, obsessive behaviors, learning difficulties (Giannopulu and Pradel, 2010; Lim et al., 2019; Masi et al., 2017; Mohajer et al., 2019).

Children with ASD have functional deficiencies in coordination, balance and motor control skills. Motor development has an

Received: 23 February.2023 ; **Accepted:** 06 May 2023; **Online Published:** 10 May 2023
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How to cite this article: Öztürk, N., Karabıçak, G.Ö. and Cavlak, U. (2023). Does Function Level of Individuals With Autism Spectrum Disorder Affect The Family Impact?. *Int J Disabil Sports Health Sci*;2023;6(2):129-138. https://doi.org/10.33438/ijdshs.1255718

important role in social communication. Thus, children with ASD who have deficiencies in motor development also experience difficulties in social communication (MacDonald et al., 2013; West 2019). Motor skills are closely related to daily activities that require coordination (Cuffaro, 2011). Although children with ASD have normal motor development, their motor competence differs compared to their peers (Sahan et al., 2022). Children with ASD have little or no ability to imitate. Therefore, they learn some gross motor skills including large muscle groups such as running, dancing, swimming, jumping rope in their later life (Korkmaz, 2003). Additionally, their fine motor skills (stringing beads on a string, throwing cubes into a box, cutting paper, etc.) are also more unsuccessful/inadequate (Darica et al., 2002). Like their peers, children with ASD need social skills in order to survive in society, interact with their peers in society (Aslan and Sahin, 2015). When considered from this point of view, it is necessary to develop social skills and reduce problematic behaviors in order for a person to be accepted in social environments.

Parents do not choose the role of being the parents of a child with different characteristics. Therefore, none of them prepares himself for this role (Coskun and Akkas, 2009). Many families with a child with ASD are worried about not knowing what they will do to their children or how it will affect their child's own life. Usually, there are some difficulties in ensuring the adaptation of this child, who has very special needs, to family life. The basis of all these worries is the fear fort he things unknown (Darica, 2002). This disability of their child is a condition that cannot be changed and is permanent. Therefore, meeting the needs of a disabled child involves a much longer period for the parents and can be difficult to bear. The needs of the disabled child care, education, financial requirements, increasingly, in social attitudes and barriers judgments about uncertainty about the current and future status of the child, families are important sources of stress (Dereli and Okur, 2000; Petrou, 2018).

Many studies were conducted to see the effect of the physical activity, motor competence and social skills issues on children with ASD separately (Bhat et al., 2011, Breslin and Rudisill, 2013; Kunzi, 2015). However, studies examining the effect of differences in the functionality levels of children with ASD on the family's level of affect is still lacking.Our study was planned to investigate the effect of the functional level of individuals diagnosed with ASD on the level of impact of thefamily.

MATERIALS AND METHODS

This cross over study was carried out with 98 children diagnosed with ASD and their parents in Aydın Efeler Municipality Autism Sports and Life Center between July 15, 2022 and January 15, 2023. The approval of the Non-Interventional Ethics Committee of Aydın Adnan Menderes University Faculty of Health Sciences was obtained for our cross-sectional study (E-15189967-050.02.04-196969).

The inclusion criteria were children diagnosed with ASD, who did not have any physical disabilities, and lived with their parents. Children with severe mental disabilities and those without an autism spectrum diagnosis were not evcluded. Parents of all children who met the inclusion and exclusion criteria were accessed. The number of children with autism spectrum disorder registered at the Autism Sports and Life Center in Aydın Efeler Municipality is 170. The families of all the children who met the inclusion and exclusion criteria were accessed for the study. As a result of the calculation made using the universe-known sample width formula, the prevalence of autism spectrum disorder was accepted as 1.69%, and when the deviation margin to be made was taken as d=0.02, it was found that it would be appropriate to include 83 people in the study at the 95% confidence level.(https://www.cdc.gov/media/releases/2018/p0426-autism-prevalence.html).

The study was conducted at the Autism Sports and Life Center. Parents were informed about the study and their consent was obtained prior to assessment. Afterwards the individual demographic information form (including the child and parent), the level of functional independence of individuals with ASDs for determination of pediatric functional independence Measure (WeeFIM), chronic impact on families of children with disabilities in order to measure The Impact on Family Scale (FIS) was utilized for assessment.

Assessment Form

Socio-demographic characteristics such as age, height, weight, educational status, marital

status, diagnosis of parents and individuals diagnosed with ASD were assessed via a form developed by researhers.

Pediatric Functional Independence Measure (WeeFIM-Functional Indepence Measure)

This scale is used to determine the functional independence levels of children can also be applied to children with developmental disabilities up to the age of 21. Under 18 headings, the child's self-care, sphincter control, transfer activities, movement activities, communication skills and cognitive skills are questioned (Msallet al., 1994).

Functions of the child are scored from 1 to 7 via WeeFIM.(7: fully independent, 6: modified independent, 5: by observation, 4: minimal help, 3: light assistance, 2: maximum assistance, and 1: full assistance). Scores from 1 to 4 indicate the level of assistance a child needs to complete an activity. 5 points indicate the child's observation or adult cue to perform the skill. A score of 6 indicates that the child can complete the activity independently but needs an assistive tool. The lowest total score that can be obtained from the test is 18 (fully dependent on all skills), and the highest total score is 126 (fully independent in all skills), (Msall et al., 1994).This scale has beeen validated in Turkish population (Sonel Tur et al., 2009).

The Family Impact

This questionnaire was developed to measure the impact of chronich childhood disease on the families. It was adapted into Turkish (Beydemir, 2008). The family impact scale consists of 27 items and four main headings that measure the level of influence of the family. These main headings are: financial burden, familial and social impact, personal strain, coping and the total impact formed by the sum of these parameters (Stein and Jessop, 2003). Appropriate answers are asked to the questions asked in the scale, in the order of 'totally agree 1, 'agree 2, 'disagree 3 and 'strongly disagree 4. The scale has a Likert-type rating ranging from 1 to 4. A minimum of 24 and a maximum of 96 points can be obtained from the scale. The items in the scale are generally related to the social, financial and emotional domains, and the higher the scale score, the higher the distress of the mothers (Stein and Jessop, 2003).

Statistical analysis

SPSS 20.00 package program was used for data analysis. The functional levels of children and the levels of parental impact were detected as dependent variables of the study. The independent variables was; socio-demographic variables.

The number, percentage distributions, average, standard deviation values were presented for distribution of the data. The descriptive characteristics of individuals with ASD and their parents, number, percentage, mean and standard deviation, skewnes kurtosis test, Mann-Whitney U test, and Student's t test were used to compare binary groups. The variables that did not match the normal distribution according to the results, as well as if parametric assumptions were met in intergroup comparisons. In order to determine the correlation of the scales, pearson correlation analysis was used when the data showed normal distribution and spearman correlation analysis was used in variables having normal distribution. From the statistical point of view, $p<0.05$ level was considered significant. In order to group participants according to their level of independence, WeeFIM scale scoring was divided into Require observation (those scoring 18-90) and independent (those scoring 91-126).

RESULTS

The number of children diagnosed with ASD in the center was 170. 58 parents out of 72 did not accept to participate in the study, and 14 children with autism were raised by one of their their relatives instead of their parents. The study was carried out with 98 children with one of their parents. The demographic information of the children and their parents are shown in Table 1. The mean age of the children with ASD participating in the study was 10.17, and 85 % of them were male. More than 30 % of the children with ASD were found to have primary school or higher education levels. 78 % of the parents who fullfilled the questionnaire were mothers, and more than 50 % had a high school education or higher. Demographic information of children with autism spectrum disorder and their parents are shown in ‘’Table 1’’.

Independence Levels of Participants

According to WeeFim results, children with ASD were most dependent on the self-care skills while taking a bath (52%); and in sphincter control, more than half of the participants were found to be fully independent. Likewise, it was determined that the participants were

mostly dependent on bathtub and shower transfers in the sub-headin of trasfer and locomotion. In cognitive skills and communication, it was determined that the participants needed more help in the sub-headings of social interaction (26.5%), problem solving (34.7%) and expression (30.6%) ‘’Fig. 1’.

Table 1. Demographic data of the participants

Participant	Measure		N (%)
	Age (M±SD)		10.17 ± 5.11
	Gender	Boy	83 (85.7)
		Girl	15 (15.3)
Child	Education Level	Never gone to school	16 (16.3)
		Kindergarten	14 (14.3)
		Primary school	24 (24.5)
		Middle school	29 (29.6)
		High school	11 (11.2)
		Leave education	4 (4.1)
Parents	Age (M±SD)		41.32 ± 8.72
	Parent	Mother	77 (78.6)
		Father	21 (21.4)
	Education Level	Primary school	19 (19.4)
		Middle school	11 (11.2)
		High school	21 (21.4)
		University	37 (37.8)
		Master/PhD	10 (10.2)
	Marital Status	Married	94 (95.9)
		Divorced	4 (4.1)

N:Number of participants, %:percentage, M: mean SD: standart deviation

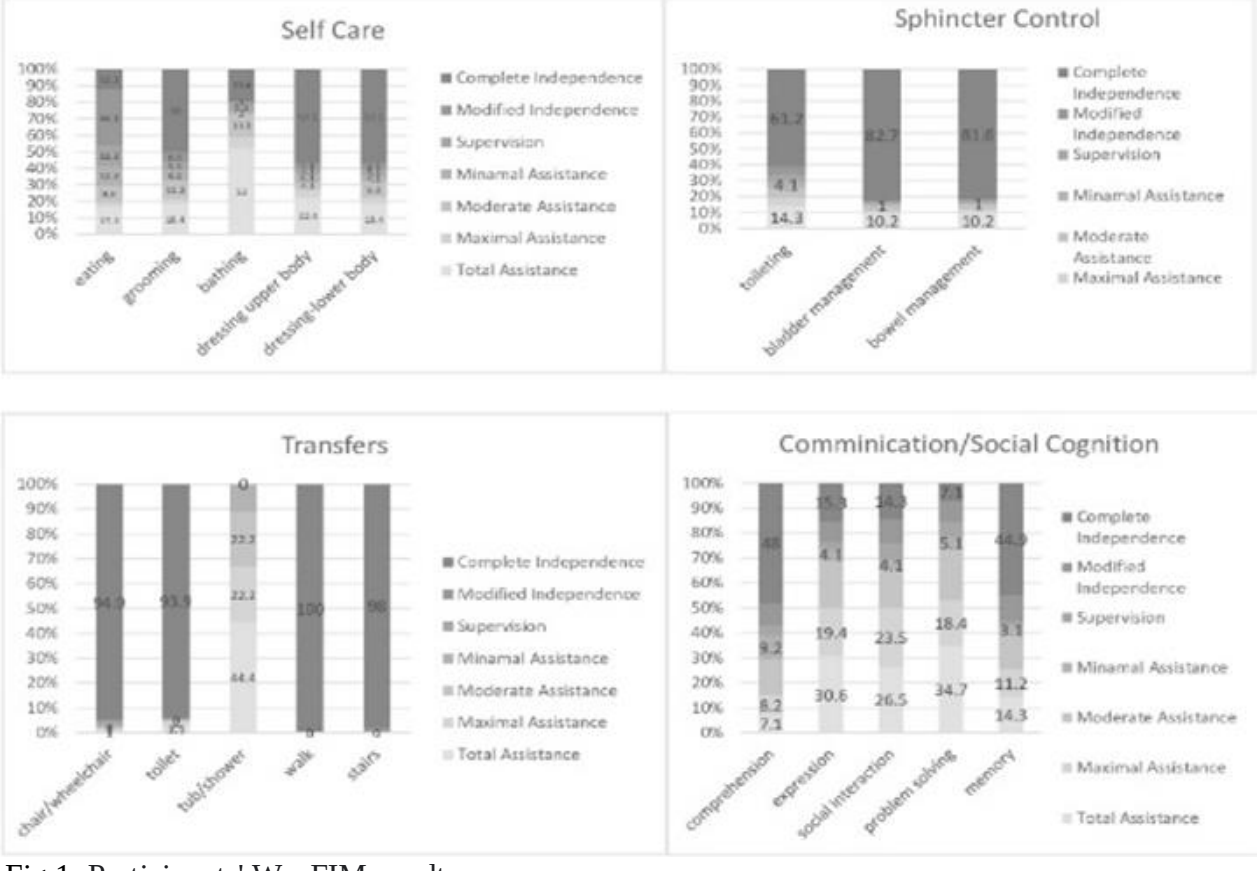

Fig 1. Participants' WeeFIM results

The Relationship between Independence Level of Children and Family Impact Scale

The financial burden sub-dimension of the family impact scale decreased as WeeFim self-care, communication, social status, and WeeFim total score increased (Table 2). This shows that as the independence of the children with ASDincreases, the financial burden of the family decreases.

Table 2. Relationship between the family ımpact scale sub-dimensions and WeeFIM sub-dimensions (N=98)

WeeFIM Sub-dimensions		Family Impact score Sub-dimensions				
		Financial Burden	Familial/Social Impact	Personal Strain	Mastery	Total Impact
Self Care	r	**-0.225***	**-0.251***	-0.156	-0.106	**-0,233***
	p	**0.026**	**0.013**	0.125	0.298	**0.021**
Sphincter Control	r	-0.083	-0.108	-0.109	-0.191	-0.118
	p	0.418	0.290	0.285	0.060	0.249
Transfer	r	0.058	-0.080	-0.126	-0.117	-0.090
	p	0.572	0.431	0.216	0.252	0.378
Transfers/Locomotion	r	0.051	-0.061	-0.127	-0.196	-0.073
	p	0.618	0.548	0.214	0.053	0.476
Communication	r	**-0.270***	-0.169	-0.063	-0.182	-0.169
	p	**0.007**	0.097	0.539	0.073	0.097
Social Cognition	r	**-0.310***	**-0.403***	**-0,330***	-0.135	**-0,402***
	p	**0.002**	**0.000**	**0.001**	0.184	**0.000**
Total Score	r	**-0.273***	**-0.305***	**-0,207***	-0.183	**-0,294***
	p	**0.007**	**0.002**	**0.041**	0.071	**0.003**

N:Number of participants, r: spearman correlation score p:p value

Additionally, statistically significant, negative and weak correlations were found between the familial/social sub-dimension of the family impact scale and WeeFim self-care (p=0.013 r=-0.251) and WeeFim total score (p=0.002 r=-0.305). In addition, a statistically significant, negative and moderate relationship was found between the familial/social sub-dimension of the family impact scale and the WeeFim social cognition (p<0.001 r=-0.403).

A statistically significant, negative and weak correlation was found between the family impact scale personal strain sub-dimension and WeeFim social cognition and WeeFim total score (p=0.003 r=-0.294).

A statistically significant, negative and weak correlation was detected between the family impact scale total impact score and WeeFim self-care (p=0.021 r=-0.233) and WeeFim total score (p=0.002 r=-0.305). In addition, a statistically significant, negative and moderate correlation was found between the family impact scale total impact score and WeeFim social cognition (p<0.001 r=-0.402).

When the family impact scale scores are examined according to their WeeFim status; There was no statistically significant difference in the total score and the scores obtained in the sub-dimensions between the situation requiring observation and the individuals in the independent state ‘’Table 3’’.

Table 3. The effect of group comparison according to children's WeeFIM score on family impact score

	Independent (91-126) N=67				
Family Impact score	M ± S.D	Med (25. - 75. Q)	M ± S.D	Med (25. - 75. Q)	Between group comparison
Financial Burden	9.52 ± 2.78	10 (9 - 12)	9.45 ± 2.26	9 (8 - 12)	0.554 (z=-0.592)
Familial/Social Impact	25.65 ± 5.77	26 (21 - 31)	23.4 ± 5.78	23 (18 - 28)	0.106 (z=-1.616)
Personal Strain	27.87 ± 4.9	28 (25 - 31)	27.3 ± 5.1	28 (24 - 31)	0.602 (t=0.523)
Mastery	7.13 ± 2.28	7 (5 - 10)	6.46 ± 2.16	7 (5 - 7)	0.152 (z=-1.432)
Total Impact	63.03 ± 12	63 (56 - 73)	60.15 ± 11.79	62 (51 - 69)	0.266 (t=1.119)

N:Number of participants, 25. - 75. Q: 25-75 Quartile values, M: mean, SD: standart deviation

DISCUSSION

As a result of this study, the disability experienced by children with ASD in self-care activities was negatively related to the financial burden of families and has a negative effect on familial and social impact. Additionally, as the communication skills and social cognition of children with ASD deteriorate, the financial situation of the families is adversely affected. Our study shows, the inadequacy of children with ASD in their social skills had a negative impact on the financial burden, familial social impact, personal strain and total impact scores of the families.

In our study, 84.7% of the children with ASD participating in our study were male. An increase in the prevalence of Autism spectrum disorder has been reported in the last decade (Fombonne, 2020; Myers et al., 2019). It is known that the rate of autism in boys is higher than in girls. In the literature, this rate has been shown as 3 to 4.3 boys versus 1 girl (Loomes et al., 2017; Maenner et al., 2020).

In our study, the number of mothers (N=77, 78.6%) who brought their children to the center was higher than the number of fathers (N=21, 21.4%). When the educational status of the parents is considered, we found that 37 parents (37.8%) are college graduates. The main care providers of children with ASD are mothers, and the burdens such as bringing them to and from education such as domestic care, special education, music and sports are mostly on mothers (Biffi et al., 2019). Especially when we look at their socio-economic levels, we see that either the mothers are not working or they have quit their jobs due to the condition of their children. Therefore, the burden of mothers is higher due to the effort they give for the care of their children, while men are more income providers in the family (Bilgin and Küçük, 2010; Magalhães et al., 2021).

In our study, it is noteworthy that children with ASD are completely dependent on bathing and transferring to the bathroom. Our finding is consistent with studies in the literature (Kilinçaslan et al., 2019; Matson et al., 2009; Mouga et al., 2015). Although there is no precise definition of daily life activities, it can be defined as self-care, home care, social life (Pepperdine and McCrimmon, 2018) and includes more basic care activities such as tooth brushing, dressing and hygiene (Guo and Sapra, 2020). Adolescents and adults show lower levels of independence than their peers in activities of daily living (Cruz-Torres et al., 2020). Conflicts exist regarding the independence of children with ASD (Howlin and Magiati, 2017) and prognosis in adulthood (Kilincaslan et al., 2019). In the study by Duncan et al., only 12% of adults with ASD lived independently in their own homes, while the rest stated that they were dependent on family, friends, and support (Duncan et al., 2018).

As a result of this study, it was determined that children with ASD who had problems during self-care activities had a negative relationship between both the familial social impact and the financial burden of the family. According to this result, the increase in the inadequacy of self-care in children with ASD who participated in our study negatively affects the financial situation and social life of the family. According to Kilinçaslan, families face financial problems in order to meet the needs of their children(Kilinçaslan et al., 2019).

Sen and Yurtsever showed that in Turkey, 48 % of families with children with ASD experience financial difficulties (Sen and Yurtsever, 2007). A significant relationship was found between the independence of the children of families who have lower economic income in daily life. (Chan et al.,2017; Del Cole et al., 2017). This result shows, the independent living skills and higher family income are related. Having a lower income is associated with limited access to services (Shattuck et al., 2011). Kilinçaslan et al.'s study is the first study conducted in Turkey on the independence of children with ASD in activities of daily living has been a reference for us. Future studies on the influence of families are needed. In this context, the fact that our work has been done in this field closes this gap. This result shows the importance of supporting families with children with ASD who are inadequate in self-care, socially and economically (Kilinçaslan et al., 2019).

In the diagnosis of ASD, one of the determining factors is the inadequacies in social communication skills. In our study, we found that the families of individuals who had difficulties in social communication were moderately affected. This result is similar to the literatüre. Limitations in social communication are most negatively related to financial burden - familial social influence and personal strain. Perceptions of families about their difficulties; behavior problems, lack of communication skills and lack of adaptive skills (Colavita et al., 2014). Children with ASD have difficulty in learning social skills because their imitation and observation skills are limited (Töret, 2017). This situation results in negative emotions in parents. (Bodur and Soysal, 2004)

Limitations of Study

Our study shows that physical disability in individuals with ASD negatively affects the financial and social lives of families. There are some limitations in our analytical cross-sectional study. Since our study was a cross-sectional study, a larger population with different education levels across Turkey could have given more meaningful results. This is a limitation of our study.

Our research was carried out to include individuals with ASD who continue special education in Aydın region. Since children with ASD who have physical disability in conditions that can attend a special education center are included in more studies, we estimate that the rates of physical disability are lower in WeeFIM results in our study. Similarly, higher education levels of parents participating in the study may have been observed. Due to this situation, different results can be reached in studies to be conducted in different populations.

In the study, the level of influence of the family was examined, the level of influence of the parents on both of them could be checked by reaching both the mother and the father. Studies comparing the effect on mother and father will contribute to the literature. These factors should be taken into account when interpreting the study, since it was conducted in a single center and with a small sample size and included parents in Turkey.

In our study, it was concluded that the level of functionality of children with ASD affected the level of impact of thefamily. Supporting families both financially and with social support programs and rehabilitation programs in cooperation with social workers, physiotherapists and psychologists are thought to facilitate the lives of families and children with ASD.

Conclusion

This cross sectional studyshows the independence of the children with ASD has a relationship with the familial/social status of the family. Physical activities are practices that can increase children's independence. Individuals who are independent will reduce the burden on families. For this reason, physical activities to be performed both in special education centers and by the family will increase independence, thus reducing the impact on the family.

Conflict of interest

The authors declare no conflict of interest. No financial support was received.

Ethics Statement

The approval of the Non-Interventional Ethics Committee of Aydın Adnan Menderes University Faculty of Health Sciences was obtained for the study (E-15189967-050.02.04-196969).

Author Contributions

Study Design, UC and NÖ; Data Collection, GÖK; Statistical Analysis, GÖK; Data Interpretation, NÖ and GÖK; Manuscript Preparation, UC and NÖ; Literature Search, GÖK, and NÖ. 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

Proximal to Distal Posture Correction Protocol For IT Band Friction Syndrome in Female Amateur Runners

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Abstract
Iliotibial band friction syndrome is an overuse knee injury that is more common in runners. In IT band syndrome, pain, and tenderness are present over the lateral aspect of the knee. It is more common in females because of physiological and anatomical factors. The objective of this research was to determine and compare the effect of proximal to distal postural correction protocol with conventional physiotherapy program for IT band friction syndrome in female amateur runners. This study included 150 female amateur runners with IT band friction syndrome based on inclusion and exclusion criteria. Then the subjects were randomly allocated into group A and group B by simple random sampling method. Group A was given proximal to distal postural correction protocol and for group B conventional physiotherapy exercise program was given. Outcome measures used were a visual analog scale, postural assessment, tenderness assessment by palpation and Ober's test. Pre and post-assessment of the above measures was taken to conform the results. The results showed a statistically significant effect of the proximal to distal postural correction protocol as compared to a conventional exercise program for IT band friction syndrome in female amateur runners. There was a significant reduction in pain (<0.0001) in individuals in group A than the group B. Postural abnormalities in IT band friction syndrome were also significantly (<0.0001) resolved and the Ober's test came as 76% negative out of 100%positive patients. Based on results, it was concluded that the proximal to distal postural correction protocol is effective in female amateur runners.

Keywords
Iliotibial Band Syndrome, Posture Correction Of Lower Limb, Physical Therapy, Running Injury.

INTRODUCTION

In the last 30 years, running has become a popular sport and participation in this sport has also increased because of which the incidence of running injuries is also increased (van der Worp and van der Horst, 2012). Running is one of the most common form of exercise and it comes with many physical and mental health benefits but can also cause injuries. In the aerobic exercises, running is associated with higher risk of overuse injury than the other forms such as swimming, walking and cycling (Francis and Whatman, 2019). As running is a weight bearing exercise, it works against gravity repetitively which leads to injuries.

The common cause of running injury is runners do "too much too soon". Iliotibial band syndrome has a 22.2% incidence of all lower extremity injuries in runners (Corey Beals and David Flanigan, 2013). It was first found in 1975 in US Marine Corp recruits during their training (Nurfadhilah and Yudhistira, 2023). Iliotibial band syndrome has a prevalence between 16% to 50% in females (van der Worp and van der Horst,

Received: 10 February.2023 ; **Accepted:** 12 May 2023; **Online Published:** 25 May 2023
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How to cite this article: Kadav, N.A, Bhende, R.P. and Shinde, S.B. (2023). Proximal to distal posture correction protocol for IT band friction syndrome in female amateur runners. *Int J Disabil Sports Health Sci*;2023;6(2):139-149.https://doi.org/10.33438/ijdshs.1249364

2012).

The Iliotibial band is the distal fascial continuation of the tensor fasciae latae, gluteus medius, and gluteal maximus and inserts on the Gerdy tubercle of the lateral tibial plateau and partially to the supracondylar ridge of the lateral femur (Nurfadhilah and Yudhistira, 2023). Iliotibial band functions as a knee extensor when the knee is in less than 30 degrees of flexion and it becomes a knee flexor after exceeding 30 degrees offlexion. IT band and lateral epicondyle come in contact at the foot strike, when the knee is 30 degrees offlexion (Nurfadhilah and Yudhistira, 2023). IT band syndrome is an overuse injury caused by repetitive friction of the Iliotibial band and lateral epicondyle during knee flexion and extension that leads to inflammation of the contact area of IT band (Nurfadhilah and Yudhistira, 2023 and van der Worp and van der Horst, 2012). It is also called as 'runners knee' (Friede and Innerhofer, 2021). ITBS is also found in cyclists, soccer players, field hockey players, basketball players, and rowers. ITBS can limit simple daily living activities such as squatting, walking down stairs, and driving which can reduce a person's occupational and physical activity (Balachandar and Hampton, 2019). This leads to decrease in their performance in sports (Shamus and Shamus, 2015). Running may give rise to knee, ankle, and foot injuries and it affects up to 83 % of amateur or competitive runners (de Araujo and Baeza, 2015). In this study, we tend to focus on ITBS in female amateur runners. Amateur runners are people who are non-professional runners or those who are insufficiently skillful. Iliotibial band friction syndrome is the most common running injury in the lateral side of the knee (Barnier and Isabelle, 2019). Although the pathophysiological mechanism is well-defined, etiologies are poorly documented and management is uncertain (Barnier and Isabelle, 2019).

The aetiology of iliotibial band syndrome is multifactorial which involves both intrinsic and extrinsic factors (van der Worp and van der Horst, 2012). The modifiable causes of iliotibial band syndrome are Uphill running, running on a tilted surface, training error, and running in one direction. The anatomical factors are internal tibial torsion, hip abductor weakness, excessive foot pronation, increased medial weight bearing on the knee and genu varum. These factors can increase the tension of the ITB and lead to iliotibial bandsyndrome (Nurfadhilah and Yudhistira, 2023). Anatomical and physiological variations between males and females can be considered as a risk factor for lower limb pathologies. Many studies have been published to determine the extent to which females are more prone to certain injuries than males. According to some studies, a narrow femoral notch, higher body mass, more laxity and increased Q-angle in females lead to higher lateral force on the patella which results in increased retropatellar pressure between the lateral facet of the patella and femoral condyle (Beynnon and Shultz, 2008; Hewett and Myer, 2005). This can cause a gradual degeneration of the joint cartilage in the patella and can lead to pain and discomfort on the lateral side of the knee (Hewett and Myer, 2005).

Also, a study carried out in the year 2011, "The effect of gluteus medius training on hip kinematics in a runner with iliotibial band syndrome" revealed the support for the theory that hip control in the frontal plane may also be a contributing factor in ITBS. Hence, clinicians are encouraged to monitor hip control as well as ITBS symptoms when they utilize the gluteus medius protocol (Schreiber and Louw, 2011).

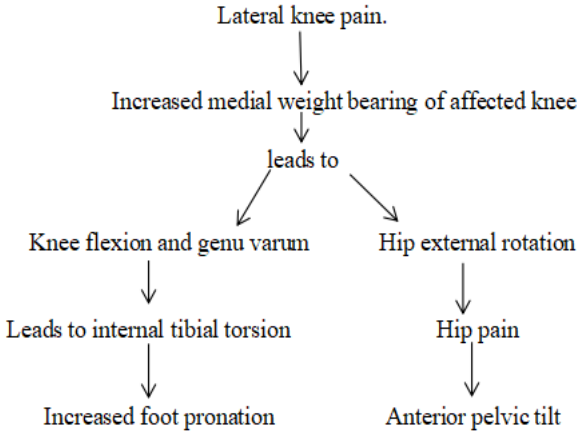
Individuals with Iliotibial band syndrome typically complain of a sharp or burning pain over the lateral joint line of the affected knee. In some cases, pain may radiate proximally or distally (Beals and Flanigan, 2013). Pain will increase with activity and in less severe cases, pain may subside upon cessation of activity. Some patients will experience a popping sound on the lateral side of the knee during activities (Beals and Flanigan, 2013). Some biomechanical researches have been conducted to know about the aetiology. Iliotibial band has both femoral and tibial attachments so it is possible that atypical hip and foot mechanics can lead to ITBS (Ferber and Noehren, 2010).

IT band friction syndrome

This flow chart depicts effect of IT band on posture. According to this, postural correction is important in IT band syndrome but most of the articles have focused on IT band stretching and abductor strengthening, and Postural correction part is neglected. Postural correction exercises and maintenance are needed for early recovery and for prevention of re-occurrence.

ITBS is diagnosed on the basis of history and physical examination. It is a clinically diagnosed and additional diagnostic studies are

not required (Beals and Flanigan, 2013). It was first diagnosed by Colson and Armour andlater by Renne (van der Worp and van der Horst, 2012). Ober's test is often used to assessIT band tightness (Corey Beals and David Flanigan, 2013). Pain assessment with the VAS, posture examination, and palpation to assess the tenderness, these techniques are used to assess the IT band syndrome (Graph 1)



Graph 1. IT band friction syndrome

In ITBS both conservative and surgical treatment options are viable.But the majority of cases are relieved with conservative management and the cases that needsurgical treatment are chronic in nature (Beals and Flanigan, 2013). This studyaims to see the effect of proximal to distal posture correction on ITBS to gain insight about the treatment ofiliotibial band syndrome in female amateur runners, in order to promoteevidence based management of ITBS.

MATERIALS AND METHODS

This comparative study has been carried out in Karad and Satara after receiving approval from the Institutional Ethical Committee. Female Amateur runners of age 18 to 30 years with normal BMI were included in the study. Other knee pathologies, Runners with orthopedic conditions, neurological condition, Surgery or trauma of lower limb in last 6 months, Overweight and underweight females were excluded.Total 168 subjects fulfilled the inclusion criteria, out of which 7 subjects did not agree to participate while other 11 terminated the treatment.Theremaining 150 individuals participated actively in the study. Then, the 150 participants were randomly allocated in two groups, namely Group A and Group B by simple random sampling.

Procedure

Participants were selected on the basis of inclusion and exclusion criteria. All the patients were explained about the study procedure intervention and the benefits of the current research work along with written consent and verbal informed consent that were taken from all the patients before including in this study. The approval of the Institutional Ethics Committee of Kırishna Institute of medical sciences "Deemed to be University Karadwas obtained for the study and helsinki declaration was complied with.

Demographic data of the patients including the name, age, gender and any history of systemic disease and medications were precisely documented before initiating the study. Assessment of the patients was done with the help of an Orthopaedician and also included pain assessment with visual analog scale, postural assessment as well as tenderness by palpation method and Ober's test.

According to the assessment, diagnosis wasconfirmed and treatment was given. The postural correction protocol was given for 4 weeks and after 4 weeks, advise on maintenance and prevention of re-injury was given. Statistical analysis and data collection was done.

Problem list

- Lateral Knee pain
- Anterior pelvic tilt
- Hip external rotation
- Hip pain (at greater trochanter of femur)
- Increased medial weight bearing of knee
- Slight knee flexion
- Weak hip abductors
- Excessive genu varum
- Internal tibial torsion
- Pronation of foot

Exercise Protocol

Following exercise program (Table 1) was given for a span of 4 weeks to the participants (Bhore and Shinde, 2023; McKay and Maffulli, 2020; Beers and Ryan, 2008; Fredericson and Wolf, 2005, Friede and Innerhofer, 2021).

After 4 weeks

Maintenance and prevent re- injury

- Warm-up - 15 min and cool down 10 min
- Stretching -10 minutes
- Use high medial wedge
- Change the direction of running to reduce load

Table 1. Exercise protocol

Duration	Exercises	Repetitions	Sets
	Cryotherapy x 15 mins		
	IT band stretch	15-30 seconds hold	3 sets
	Quadriceps stretch	15-30 seconds hold	3 sets
Week 1	Lunges	15-30 seconds hold	3 sets
	Hamstring stretch	15-30 seconds hold	3 sets
	Seated floor stretch Hamstring stretch	15-30 seconds hold	3 sets
	Calf Stretch	15-30 seconds hold	3 sets
	SLR	10 repetitions	1 set
	It band stretch, hamstrings stretch & quadriceps stretch	30 -40 sec hold	3 sets
	SLR + weights	10 reps	3 sets
	Abductors stretch	20-30 seconds hold	3 sets
	Prone extension hangs	10 repetition	3 set
Week 2	Knee extension with resistance band in seating	15 repetition	3 sets
	Single leg standing	10 sec hold and 10 repetition	
	Squats	10 repetition	3 sets
	Kneeling leg lift	10 sec hold , 10 repetitions	3 sets
	Clamshell exercise	10 sec hold , 10 repetitions	3 sets
	Seated calf muscle stretch	20-30 sec hold	5 sets
	IT band stretch	20-30 sec hold	5 sets
	Quadriceps stretch	20-30 sec hold	5 sets
	Abductor stretch	20-30 sec hold	5 sets
	Single leg standing	20-30 sec hold	5 sets
Week 3	Single leg squats	15 repetitions	5 sets
	Crunches	15 repetitions	3 sets
	Trunk rotation	15 repetitions	3 sets
	Bridging	15 repetitions	3 sets
	Planks	15 repetitions	3 sets
	IT band stretch	20-30 sec hold	5 sets
	Calf muscle stretch	-20-30 sec hold	5 sets
	Core strengthening	15 repetitions	5 sets
	Abductors strengthening	15 repetitions	5 sets
	Trunk rotation	15 repetitions and	5 sets
Week 4	Rolling of feet -	10 sec hold , 10 repetitions	2 sets
	Ball exercise of foot	5 repetition	5 sets
	Start running with medial wedge shoes		
	Line walking		
	Toe walking , Small quick steps on the spot -20 repetitions and 3 sets		

Group 2: ***Conventional physiotherapy***

- Rest
- Ice
- Stretching of IT band and Tensor Fascia Latae (TFL)
- Strengthening of adductors

Statistical analysis:

The data was collected and statistically analyzed. Assessment of pain and tenderness was done by using paired t-test. The postural examination in anterior, posterior and lateral view was analyzed by Chi-square test. Ober's test were analyzed by percentage. Statistical significance was accepted if the p values is $p < 0.05$.

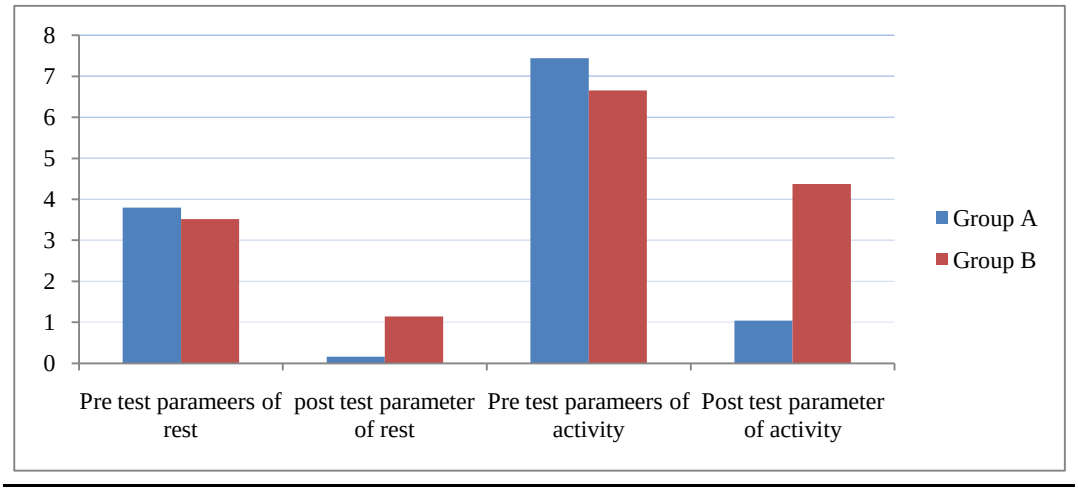
RESULTS

This study was carried out among 150 female amateur runners with IT band friction syndrome. According to statistical analysis the effect of posture correction exercise program was significantly effective for IT band friction syndrome in female amateur runners as compared to conventional exercise program. There was a significant reduction in pain ($p<0.0001$) in Group A than the group B. Postural abnormalities in IT band friction syndrome were also significantly ($p<0.0001$) resolved and the Ober's test came as 76% negative out of 100% positive patients.

Table 2. Pain assessment

Group	Pre-test		Post -test		Paired t test	P value	Result
	Mean	SD	Mean	SD			
VAS at rest							
Group A	3.800	1.685	0.1600	0.628	19.140	<0.0001	Extremely significant
Group B	3.520	0.963	1.146	1.322	14.458	<0.0001	Extremely significant
VAS on activity							
Group A	7.440	1.222	1.040	1.976	28.297	<0.0001	Extremely significant
Group B	6.653	1.133	4.347	2.474	9.460	<0.0001	Extremely significant

Graph 2. Pain assessment



Interpretation

The above table and graph interpret that intensity of the pain of group A was decreased as comparedto group B. The Group A had a mean at rest which was 3.800±1.685on pre test and was reduced to 0.1600±1.628 post test while group B had a mean of 3.520±0.963 on pre test which was reduced to 1.146±1.322 post test. The mean of group A on activitywas 7.440±1.222 decreased to 1.040±1.976 on post test while the group B had a mean of 6.653±1.133 on pre test which was reduced to 4.347±2.474 post test. The paired t-test showed a value of 19.140 and a p-value <0.0001 which was extremely significant at rest. On activity, the p-value was <0.0001 and paired t test value was 28.297 for group A while for group B it was 14.458 on rest and on activity it was 9.460. P value for group B was <0.0001 on activity and at rest as well (Table 2).

Table 3. Postural assessment of anterior view

Anterior view					
Group		**Pre test**	**Post test**	**P value**	**Result**
Group A	**Normal knee**	1	61	<0.0001	Significant
	Knee varus	74	14		
	Normal tibia	34	68	<0.0001	Significant
	Internal tibial torsion	41	7		
Group B	**Normal knee**	5	19	0.0038	Significant
	Knee varus	70	56		
	Normal tibia	26	36	0.1356	Not Significant
	Internal tibial torsion	49	39		

Interpretation

Table 3. Chi- test was used to obtained the results for postural assessment for anterior, lateral and posterior view. This table shows that the knee and tibial abnormalities are decreased in post test in group A. For group A, p value was <0.0001 which was significant, but for group B it was 0.1356 for tibia which was not significant and for knee,0.0038 which was significant.

Table 4. Postural Assessment inlateral view

Lateral view					
Group		**Pre test**	**Post test**	**P value**	**Result**
Group A	**Normal knee**	1	61	<0.0001	Significant
	Knee varus	74	14		
	Normal pelvis	26	73	<0.0001	Significant
	Anterior pelvic tilt	49	2		
	Normal foot	6	60	<0.0001	Significant
	Foot pronation	69	15		
Group B	**Normal knee**	5	19	0.0038	Significant
	Knee varus	70	56		
	Normal pelvis	10	20	0.0662	Not Significant
	Anterior pelvic tilt	65	55		
	Normal foot	7	16	0.0698	Not Significant
	Foot pronation	68	59		

Interpretation

Table 4. This table depicts of postural assessment in lateral view, in which group A showed significant results for knee, foot and pelvis. The p value of group A was <0.0001. The group B was having P value of 0.0038 for knee which was significant, p value for foot and pelvis was 0.0698 and 0.0662 which was not significant.

Table 5: Postural Assessment in posterior view

Posterior view					
Group		**Pre test**	**Post test**	**P value**	**Result**
Group A	**Normal knee**	1	61	<0.0001	Significant
	Knee varus	74	14		
	Normal pelvis	26	73	<0.0001	Significant
	Anterior pelvic tilt	49	2		
Group B	**Normal knee**	5	19	0.0038	Significant
	Knee varus	70	56		
	Normal pelvis	10	20	0.0662	Not Significant
	Anterior pelvic tilt	65	55		

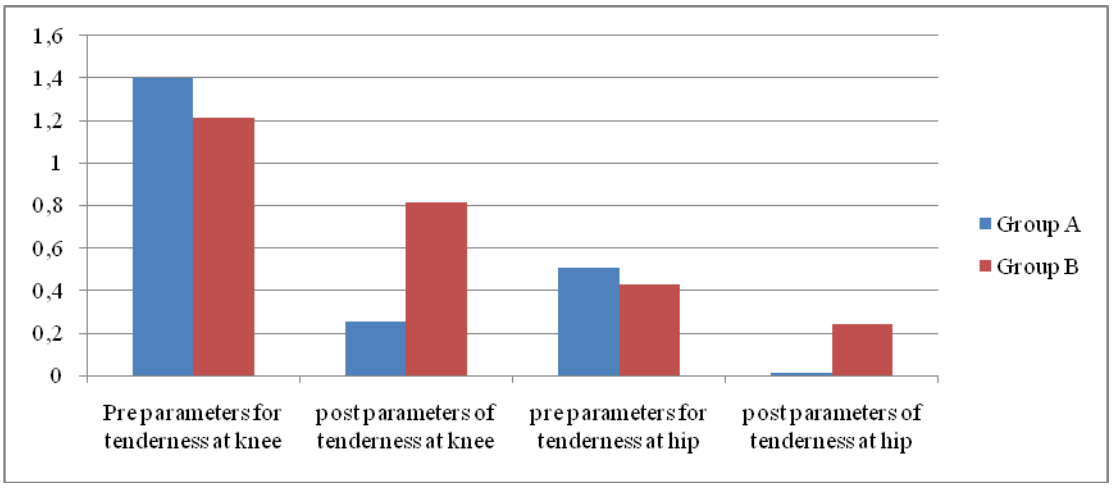
Interpretation

Table 5. This table interpreted that in the group A abnormality of knee and pelvis was decreased in post test assessment which was significant. In the group B, result was not significant for pelvis as the p value was 0.0662 and knee it was significant0.0038

Table 6. Assessment of tenderness

Tenderness at knee							
Group	**Pre-test**		**Post –test**		**Paired t test**	**P value**	**Result**
	Mean	**SD**	**Mean**	**SD**			
Group A	1.400	0.545	0.253	0.5220	15.758	<0.0001	significant
Group B	1.213	0.4124	0.8133	0.3923	6.083	<0.0001	Significant
Tenderness at hip							
Group A	0.506	0.665	0.013	0.115	6.257	<0.0001	significant
Group B	0.426	0.497	0.24	0.4300	4.121	<0.0001	Significant

Graph 3. Assessment of tenderness.



Interpretation

Table 6 and graph 3: This table and graph interpret that grade of tenderness of group A was decreased as compared with group B. The Group A had a mean of tenderness at knee which was 1.400±0.545 on pre test and was reduced to 0.253±0.5220 post test while group B had a mean of tenderness at knee was 1.213±0.497 on pre test which was reduced to 0.8133±0..3923 post test. The mean of group A at hip was 0.506±0.665 then it was decreased to 0.013±0.115 on post test while the while group B had a mean of 0.426±0.497onpre test which was reduced to 0.24±0.4300post test.

The paired t-test has a value of 15.758 and a p-value <0.0001 which was significant for tenderness at knee. At hip, the p-value was <0.0001 and paired t test value was 6.257 for group A while for group B it was 4.121at hip and at knee it was 6.083. P value for group B was <0.0001 at knee and at hip for tenderness.

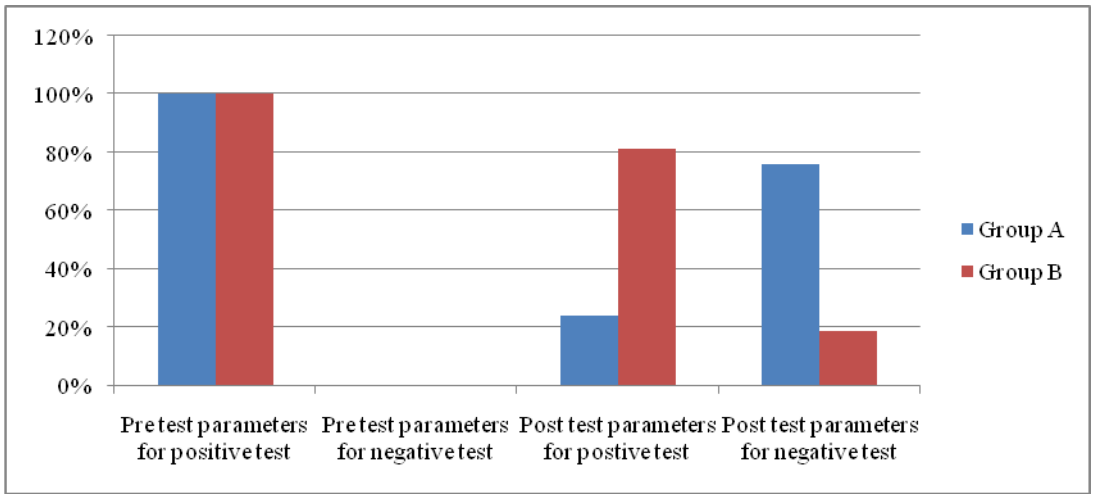
Interpretation

This table 7 and graph 4 interpret that the Ober's test was positive in 150 participants on pre test assessment. On post test assessment 76% participants were negative and 24% were positive in group A out of 100%. In group B, 18.7% were negative and 81.3% participants were positive on post test out of 100%.

Table 7. Ober's test.

Group	**Pre test**		**Post test**	
	Positive test	**Negative test**	**Positive test**	**Negative test**
Group A	100%	0	24%	76%
Group B	100%	0	81.3%	18.7%

Graph 4:Ober's test



DISCUSSION

The aim of this research was to study and find the effect of the proximal to distal postural exercise program for IT band syndrome in female amateur runners. According to inclusion and exclusion criteria, 168 femaleswere found with IT band friction syndrome. Out of which 7 female refused to take part in this study and 11 females terminated the treatment. Then the study was carried out with 150 females who wererandomly divided into 2 groups by simple random sampling. Then pre assessment of pain threshold, postural assessment, tenderness and Ober's test were taken. Group A included 75 participates who underwent proximal to distal postural exercise program for IT band syndrome for 4 weeks and group B followed a conventional exercise program for IT band syndrome. Then a comparison between the effectiveness of the two groups was made.

By taking all the results into consideration, we can say that the proximal to distal posture correction protocol for IT band syndrome in female amateur runners is effective. Group A subjects showed better improvement in pain threshold, muscle length, severity, and walking distance as compared to group B.

A systematic review of literature on the aetiology, diagnosis and treatment of iliotibial band syndrome inrunners was carried out in 2012 in which, adult runners below 18 years were included. This study revealed that, as the participation in this sport was increased, incidence of running related injuries also increased (van der Worp and van der Hors, 2012).

Reed Ferber et al undertook a research study with the purpose of finding out difference in running mechanics between runners who had history of ITBS and runners with no knee related running injuries. This study revealed that it is possible that atypical hip and foot mechanics could be a reason in the development of iliotibial band syndrome because ilotibial band is attached to femur and tibia. This study included 35 females with previous history of ITBS and 35 healthy females with no history of running injuries of knee. Internal movement during the stance phase of running gait was measured and comparison of hip, knee and ankle in 3 dimensional kinematics were done. The results suggested that correction of atypical lower limb kinematics may decrease IT band stress and it should be considered in the treatment of iliotibial band syndrome (Ferber and Noehren, 2010).

It is seen that due to its role in stabilizing the knee joint and with repeated flexion-extension movements of the knee, the tightness on the Iliotibial Band (ITB) increases. The tightness that occurs in the ITB, which is connected to the knee and hip joints, has also been seen to have a critical importance in the performance of the athlete and in athlete injuries. A study was carried out to investigate the relationship between Ober inclination angle (OIA), pressure pain threshold (PPT) and hip abductor muscle strength in athletes with ITB tightness which included 45 participants between 18-25 years of age. This study concluded that OIA was correlated with PPT and hip abductor muscle strength in athletes with ITB

tightness. As the OIA decreased, the hip abduction strength and
the PPT level decreased (Ünivar and Demirel, 2022).

Similarly, a study named “Effectiveness of a Conditioning Program onAmateur Female Marathon Runners” wherein 52 amateur female marathon runners, pain andexertion using pain assessment and Borg Scale was evaluated. Occurrence of incontinence wasassessed by asking a simple ‘yes’ or ‘no’ question and Delayed onset muscle soreness (DOMS) was assessed using pain pressure threshold (PPT) 24 hours post run. Then these females were administered a structured conditioning exercise program which was proven to be effective in reducing their risk of injuries and problems related to women’s healththat occur while running a marathon (Kolhatkar and Shinde, 2020)

A study carried out in the year 2021, named “Effect of lower limb proximal to distal muscle imbalance correction on functional pes planusdeformity in young adults” which included 40 participants with functional pes planus deformity and were divided into 2 groups, that received the baseline treatment for the muscle imbalance along with the intrinsic muscle strengthening exercises (experimental group) or agroup that received only intrinsic muscle strengthening exercises (control group) for a span of 6 weeks. This study further concluded that muscular imbalance corrective exercises and intrinsic muscle strengthening exercises are to be recommended to correct the deformity as well as to prevent the abnormalities in people with functional pes planus. (Sawant Janhavi and Sandeep, 2021)

Barnier et al conducted a study with an aim to find that the use of postural insoles may play a role in the recovery in runners with ITBS assuming that plantar inefficiency may promote postural and kinetic control disorder underlying ITBS. They used visual analogue scale to assess the pain, Nobel and Runner test, posture assessment as outcome measures. This study stated that use of postural insoles have therapeutic benefits in symptomatic improvement of runners with ITBS (Barnier and Isabelle, 2019).

Also , a recent study carried out in atheletes , which was about comparison of anxiety in athletes doing sports on different surfaces. The surfaces compared in this study included parquet floor, turf surface and artificial turf surface.The "Sport Injury Anxiety Scale" was used in order to determine the sports injury anxiety levels of the participants. The scale was implemented online through Google Forms.It was observed that athletes doing sports on parquet floor had higher levels of sports injury anxiety compared to those doing sports on turf and artificial turf surface. Considering that athletes who do sports on parquet floor had high levels of sports injury anxiety, it is important that these athletes should be supported in terms of coping with anxiety (Gerçek et al, 2023) Similarly, in our study the female amateur runners are prone to run on uneven as well as even surfaces. So, it is equally important for these females to also check their anxiety during performing the running activity and thereby subsequent anxiety coping strategies can be incorporated.

A study done by V. Balachandra et al regarding determining the lower limb biomechanics and conservative intervention in ITBS including the adults within the age between 18 to 50 years with ITBS., concluded that the greater hip adduction , greater knee internal rotation and greater femoral external rotation are the risk factors for ITBS. In the treatment of ITBS they used NSAID’s, ITB stretching, hip abductors strengthening which reduced the pain and prevented recurrence for up to 6 months (Balachandar et al., 2010).

On the other hand, the negligence of the iliotibial band syndrome sometimes canresult into patellofemoral pain syndrome. Patients might feel pain around and under the patella in addition to the knee and hip pain. ITBS is treatable with appropriate breaks from sports but not to give up on them and also with the help of proper treatment. Once the pain is reduced, then slow and progressive return to the regular activities is possible (Francis et al., 2019).

The prevention of Iliotibial band syndrome might be difficult if the individual is a long-distance runner but can decrease the risk by doing some techniques like: Avoid running up hill or down a hill, slow warm up and slowcool down, wearing supportive shoes which is important, avoid running on tilted surface, shift training intensity gradually, slowly speed up andavoid running in one direction for long time.

The future scope in terms of research on management of ITBS in runners should pay more attention on concealing treatment.The treatment

should include advice on coordination and style of running, choice of shoes and running surface, strengthening of hip musculature. Also, along with conservative intervention targeting bio-mechanical factors associated with ITBS are required to treat ITBS and prevent its recurrence

Conclusion

On the basis of results it can be concluded that the group A who followed proximal to distal postural exercise program showed better improvement in posture and pain intensity as compared to group B. Hence, we can conclude that proximal to distal posture exercise program is significantly effective in the treatment of IT band syndrome in female amateur runners. Similarly utilizing a multifaceted patient centered approach has been proven to be quite effective and lead to successful return to running activity.

Acknowledgement

I would like to express my sincere gratitude to the management of Krishna Vishwa Vidyapeeth, Karad for allowing me to perform this research by supplying me with the necessary materials. I appreciate Dean Dr. G. Vardharajulu sir's help and advice. My deepest gratitude to all the staff members who guided me through my research. I would like to take this time to thank everyone who helped me to conduct this study run.

Conflict of interest

The authors declare no conflict of interest. No financial support was received.

Ethics Statement

The approval of the Instıtutional Ethics Committee of Kırıshna Instıtute of medical sciences "Deemed to be University Karadwas obtained for the study (Protocol number 138/2021-2022).

Author Contributions

Study Design, SBS and RB; Data Collection, NK; Statistical Analysis, SBS; Data Interpretation, RB and NK; Manuscript Preparation, SBS and RB; Literature Search, SBS, and NK. 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 The Postural Based Telerehabilitation on Pain, Posture, Enegry Consumption and Performance in Mechanic Neck Pain: A Crossectional Study-12-Week Trial

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Abstract
Telerehabilitation can be proposed to individuals with mechanic neck pain to improve functional abilities and limit the risk of early degeneration of the musculoskeletal system due to postural problems. This study was conducted to investigate the effect of 12-week telerehabilitation on pain, posture, performance, and energy consumption in individuals with mechanical neck pain.A telerehabilitation program was applied to 78(23.79 ± 8.95)individuals with mechanic neck pain. A synchronized posture-based exercise program was performed 3 times a week for 12 weeks. Pain, postural measurements, performance, and energy consumption levels were determined for each participant before and after telerehabilitation program. Craniovertebral, shoulder, and eye angle were measured with a smartphone application. Clinical tests were used to measure muscle shortness. Performance measurement was evaluated with the 6-minute walk test. The Physiological Cost Index was used for energy consumption assessment.Craniovertebral angle were increased (p=0.001),eye angles were improved after 12-week telerehabilitation (p=0.002). Shortenedpostural muscles were assessed as in normal length after telerehabilitation (p<0.001). There was a significant increase in performance after telerehabilitation (p=0.001). No significant changes in energy consumption of individuals were found after telerehabilitation (p=0.384).This study showed positive effects of telerehabilitation in individuals with mechanic neck pain on pain, posture, and performance. Telerehabilitation can be suggested as an effective modality to decrease pain, improve posture, and performance in individuals with mechanic neck pain.

Keywords
Neck Pain; Posture; Performance; Telerehabilitation; Energy Consumption; Exercise

INTRODUCTION

Staying in the same posture for a long time causes musculoskeletal system problems. Especially in the internet age, excessive usage of mobile phones and other electronics leads postural problems in many people (Arshadi et al. 2019). Among these postural problems, the common ones are decreased cervical lordosis, increased thoracic kyphosis, shortened pectoral muscles, rounded shoulders, and mechanical neck pain. The most common of these problems is the mechanic neck pain. Mechanical neck pain is defined as the pain that occurs in the cervical, occipital, or posterior scapular region without any specific pathology such as a neurological problem, tumor or

Received: 17 February.2023 ; **Accepted:** 22 May 2023; **Online Published:** 26 May 2023
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How to cite this article: Yıldırım Şahan, T., Türker, D., Aksu, BN., Özcan, M., Yavaş, E. and Bicici Uluşahin, S. (2023). Effects of The Postural Based Telerehabilitation on Pain, Posture, Enegry Consumption and Performance in Mechanic Neck Pain: A Crossectional Study-12-Week Trial. *Int J Disabil Sports Health Sci*;2023;6(2):150-160 https://doi.org/10.33438/ijdshs.1252477

inflammation. It is stated that most of the mechanical acute neck pain attacks in adults are resolved with or without treatment, however approximately 50% of the patients report that the pain is recurrent and chronic (Joshi et al. 2019). It also causes economic burden, loss of labour (Hogg-Johnson et al. 2009).

Applications such as strengthening, stretching, yoga, pain-oriented approach and behavioural treatments are performed for an ideal posture to correct postural problems (Harman et al. 2005). It was proved that these exercise applications improve muscle size, increase muscle strength, and help to gain awareness of postural smoothness during the activities of daily living. There are studies in which short and long-term exercise programs were applied to improve chronic neck pain and postural disorders, however studies about mechanical peck pain are limited (Harman et al. 2005; Joshi et al. 2019; Masaracchio et al. 2018). Cazotti et al (2018) stated that Pilates exercises improve quality of life and are used as an analgesic in mechanical neck pain. Arshadi et al. (2019) showed that corrective exercises improve upper quadrant musculoskeletal disorders in people with upper crossed syndrome. Besides, Jaroenrungsup et al. (2021) demonstrated that self-posture corrective exercises improve neck muscle strength, muscle length, and endurance in individuals with head-forward syndrome.

The trapezius, pectoralis major- minor, and latissimus dorsi are the key muscles in individuals with mechanical neck pain and postural problems (Cleland et al. 2006). Dysfunction of these muscles is seen in individuals whose joint mechanics are affected in the cervical region. Decrease in cervical lordosis, increase in thoracic kyphosis, shortening of pectoral muscles and rounding of shoulders cause increased loads on posterior neck muscles (Singla et al. 2017). These increased loads cause pain, tension, discomfort and musculoskeletal disorders in the neck and thoracic region (Kocur et al. 2019). For this reason, muscle strengthening and stretching exercises that can modify these postural loads, are included as recommended exercises (Park et al.2021). Strengthening the deep flexor muscles and shoulder retractor muscles, stretching the cervical extensor and pectoral muscles are among the recommended exercises (Arshadi et al. 2019). Jaroenrungsup et al. (2021) applied Chintack, neck isometric exercises, scapulothoracic muscle strengthening exercises and stretching exercises for trapezius muscles for 6 weeks in individuals with head-forward syndrome and showed that neck muscle strength and muscle length improved, and neck muscle endurance increased. Cazotti et al (2018) applied pilates exercises for 12 weeks and achieved improvements in individuals with mechanical neck pain. When the literature is examined, it has been seen that the studies have developed especially in the direction of telerehabilitation, but there is a need for studies showing the effect of tele-exercise applications developed for individuals with mechanical neck pain (Cazotti et al. 2018; Jaroenrungsup et al 2021).

Telerehabilitation was seen as an alternative method rather than a mandatory part for the health system. The concept of telerehabilitation is suggested as a form of rehabilitation services, but the COVID-19 pandemic has accelerated the telerehabilitation trend for continuity of rehabilitation services (Fiani et al. 2020). Telerehabilitation can reduce the cost of providing services for patients as well as healthcare systems. Easy patient access, individuality, and self-efficacy lead to reduced hospitalizations, increased health literacy and health-related quality of life (Bowman et al. 2022). Telerehabilitation applications can be carried out on different populations for different purposes such as tele-assessment, tele-education, and tele-rehabilitation (Fatoye et al. 2020; Hernando-Garijoet al. 2021). In the meantime, telerehabilitation continue to grow and studies found that telerehabilitation interventions were effective on pain and posture. However, limited number of studies investigated telerehabilitation applications on mechanical neck pain (Alsobayelet al. 2021; Kosterink et al. 2010; Özer et al. 2021).

Telerehabilitation has only recently been applied to individuals with mechanical neck pain, and a very few studies are available. As Özer et al. (2021) compared synchronous and asynchronous exercise programs in chronic neck pain and, there is only one study was found in mechanical neck pain by using telerehabilitation (Alsobayelet al. 2021). Therefore, this study aimed to assess the effect of the synchronized tele-exercise protocol, which is generally applied in clinical setting, on posture, energy consumption and performance in individuals with mechanical neck pain.

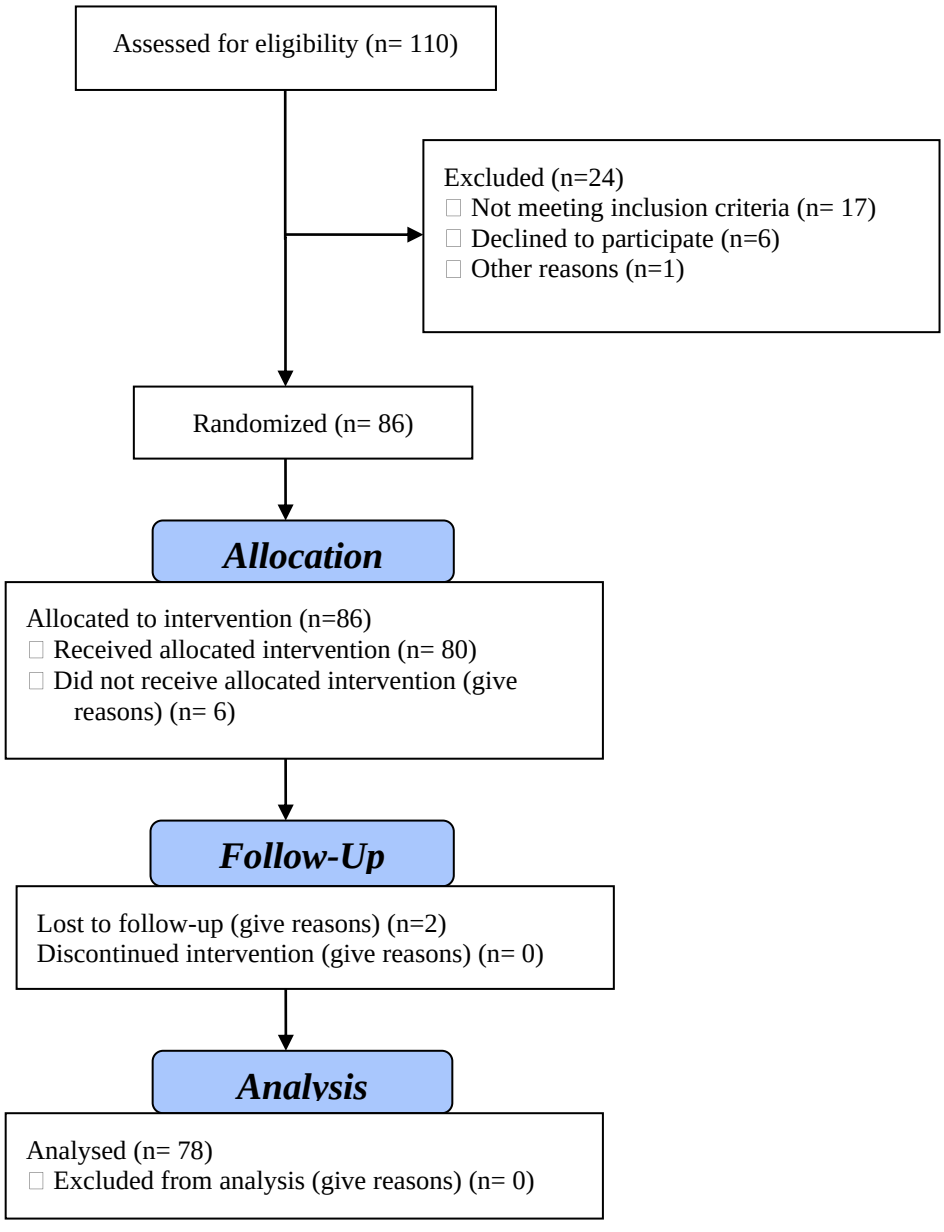
MATERIALS AND METHODS

This cross-sectional study was conducted at the Faculty of Physiotherapy and Rehabilitation, University of Health Science Turkey. Evaluations were performed in the university physiotherapy laboratories. Participants were informed about the study and provided written informed consent.

Participants

Individuals diagnosed with mechanical neck pain who applied to the university's excellence center between September 2021 and December 2021 were screened. A cross-sectional selection of 110 individuals met the inclusion criteria. All participants signed a written, informed consent form.This study was performed in accordance with the 1964 Helsinki declaration and its later amendments. University of Health Science Turkey, Gulhane Scientific Research Institutional Review Board approved this study (protocol number: 2022-80).Assessments were made before and after posture-based telerehabilitation.The exercise program was applied online, and the evaluations were applied face to face. G * power 3.1.9.4 program was used to calculate sample size, with 5% type 1 error, 10% type 2 error and 90% power. The sample size was calculated as 68 based on our pilot study by applying six-minute walk test. However, 80 participants were included in case of dropouts (Figure 1).

Figure1. CONSORT 2010 flow diagram



The inclusion criteria were: i) age between 18-45, ii) volunteer to participate iii) having neck pain for at least 3 months, iv) mechanical neck pain diagnose obtained by an orthopaedist or a neurologist. The exclusion criteria were i) having inflammatory rheumatological diseases, or structural deformity ii) having previous surgery related to the cervical spine, iii) having traumatic neck pain, iv) having inflammatory or malignant disease, v) congenital malformation of the spine, vi) having radical symptoms such as paresis, tingling or numbness, vii) receiving corticosteroid or opioid treatment over the past year.

Demographic variables were recorded. Visual analog scale (VAS) was used to measure mechanical neck pain level (Begum et al. 2019). Neck muscles shortness was evaluated with clinical test(OtmanS. 2014). Shoulder, eye and craniovertebral angle measurement was performed with Kinovea(Puigi Divi et al. 2017). The Six Minute Walk test was used for performance assessment (Enright P.L. 2003). Functional Cost Index was used for energy consumption calculations(Graham et al. 2005).

Visual analogue scale

Patients were asked to mark their pain level on a horizontal visual analogue scale consists of a 10-cm line. The ends were defined as extreme limits of pain, oriented from left (no pain) to the right (extreme pain). Cut-offs for classifying pain intensity on the 10 cm line were; less than 3 cm mild pain, between 3 and 6 cm moderate pain, bigger than 6cm severe pain (Begum et al. 2019).

Craniovertebral, Shoulder, and Eye Angles

The assessments of craniovertebral angle, shoulder angle and eye angle were measured by using lateral-photography via Kinovea program (Elwardany et al. 2015). In standing lateral posture, spinous process of C7, the canthus of eye, and the tragus of ear were marked (Fig. 3)(Ruivo et al. 2015) . Craniovertebral angle was determined by two reference points: one line that runs from the swallow of the ear to seventh cervical vertebra (C7) and other horizontal line parallel to the ground that passes only through the spinous apophysis of C7. Measured angle less than 50◦–53◦ indicates forward head posture(Gallego-Izquierdo et al. 2020). The eye angle, the angle formed at the intersection of horizontal line through the tragus of ear and external canthus of the eye, was measured. Shoulder angle, the angle formed at the intersection of horizontal line through C7 spinous process and the midpoint of greater tuberosity of humerus and posterior aspect of acromion, was measured (Contractor et al. 2020).

Figure 2. Craniovertebral (a), eye (b) and shoulder (c) angle measurement

6-minute walk test (6MWT)

The 6-minute walking test (6MWT) was used to determine performance of participants. The outcome of the test is the distance covered over a time 6 minutes. Participants were asked to walk as far as possible for 6 minutes. Participants walked back and forth in 10 m long section of hallway. The test track was marked at 1-meter intervals in order to calculate the distance covered at the end of the test (Enright P.L. 2003).

Physiologic cost index (PCI)

The purpose of PCI is to measure energy index of gait in different populations. Physiological consumption index was calculated with [(hearth rate after walking)- (resting hearth rate)) / (walking velocity)] equation (Graham et al. 2005). Hearth rate was measured before and after test with Polar watch (Polar S725X, Polar Electro, Finland) (Hill et al. 2020).

Assessment of muscles shortness pectoralis major (clavicular and sternal part)

While testing pectoralis major muscle's clavicular part, patient was asked to be in supine position with the knees bent, elbows were placed in the extension and the shoulder in external rotation with 90-degree abduction position. If the arm drops and stays flat on the table without trunk rotation, it was accepted as normal length. If the arm didn't drop on the table, it was accepted as shortness. Sternal part of the M. Pectoralis Majors' shortness test was measured in the same supine position while shoulder in external rotation, 135 degrees of abduction, and the elbow was extended. If the arm didn't drop on the table, shortness was recorded as positive (Otman S. 2014). The shortness tests were done face to face.

Pectoralis minor

M. Pectoralis minor shortness test was applied on a hard bed, with the patient's knees flexed, the lumbar region straight, palms facing down, and supine on the side of the trunk. The physiotherapist, who applied it for shortness, stood by the patient's bedside and observed the shoulder girdle and applied pressure down the shoulders to make sure there was no shortness (Otman S. 2014).

Latissimus dorsi

M. Latissimus dorsi shortness test; While the patient was lying on his back with his knees flexed and palms facing down, the physiotherapist who performed the test was asked to raise the patient's arms above his head by flexing them with the elbow extended. Thearms should be flexed by keeping the head by theside, but thearms should touch the bed without disturbing thes mooth ness of the lumbar region. If these muscles are short, they will not contact. To determine the short ness, the angle between the humerus and the bed is measured or the distance between the lateral epicondyle of the humerus and the bed is measured (Otman S. 2014).

Intervention

The training program included following exercises: bilateral pectoral stretching, chin tack, cervical isotonic exercises, stretching of the upper trapezius and longus colli, scapular region strengthening exercises, shoulder capsular stretching, Wand exercises, and stabilization exercises. The training program applied 3 times a week, 50 minutes each time, for 12 weeks. (Figure 3). Participants performed the synchronous tele-exercises via Microsoft Teams program. A physiotherapist who is specialised in corrective exercises, run the telerehabilitation sessions. To ensure that participants exercise sufficiently, exercise variation was set according to the ACSM recommendations (AmericanCollege of Sports Medicine, 2019).

Data analysis

The SPSS 21 package program (IBM Corp., Armonk, NY, USA) was used for statistical analyzes. Central tendency and distribution measures and descriptive statistical data were obtained for all variables in the study. Then, Kolmogorov-Smirnov test and other normality tests were used to evaluate whether the variables showed normal distribution. Descriptive characteristics of individuals were given as mean, standard deviation, and frequency. Statistical significance level was accepted as $p < 0.05$. Wilcoxon paired sample tests were used to compare the values before and after telerehabilitation. Cohen's d calculation between group difference measures was used to determine effect sizes. Cohen explained that a small effect has an effect size of 0.2, a moderate effect of 0.5, and a large effect size of 0.8. The values were evaluated at the significance level $p<0.05$ (Larner A.J. 2014).

RESULTS

The demographic details of the participants; age, height, weight, and BMI are presented in Table 1. A significant difference was observed before and after telerehabilitation on the CVA ($p=0.001$) and eye angle ($p=0.002$) with an average improvement in the angles +3 degrees. The performance on the 6MWT was significantly improved ($p < 0.001$) with an average increase in the distance of 6.24 m before and after rehabilitation. No significant change was found between before and after telerehabilitation for the energy consumption of individuals ($p=0.384$) but there is a decrease in heart rate /velocity about 0.8 (Table 2). There was a significant difference in muscle shortness between before and after telerehabilitation (Table 3).

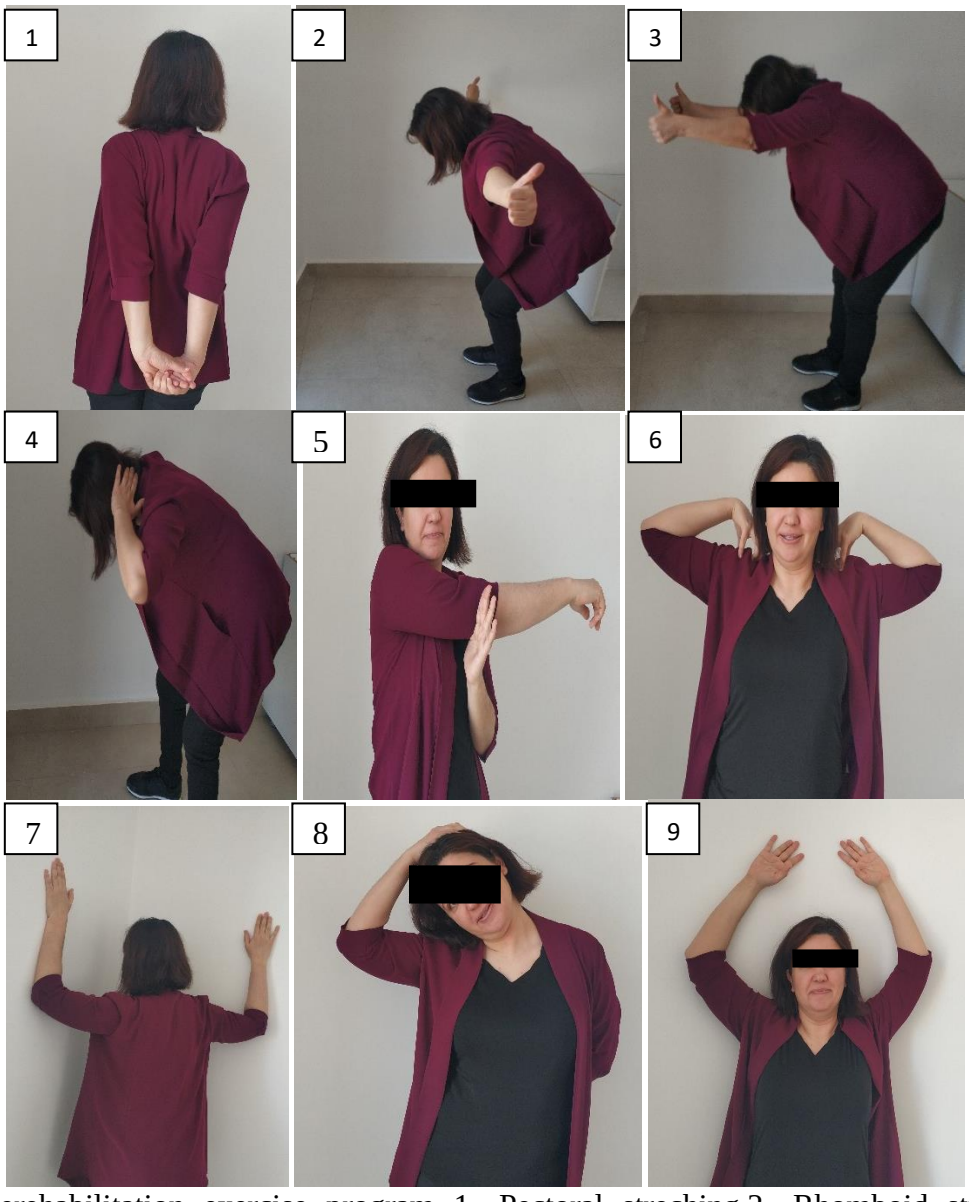


Figure 3. Telerehabilitation exercise program 1- Pectoral streching,2- Rhomboid strenghening, 3- Deltoid, trapezius strenghening, 4- Toracal and Lumbal extansor strenghening,5- Shoulder capsule streching bilateral, 6- Circling back with arms, 7- Streching bilateral pectoral muscles, 8- cervical muscle strecthing, 9- angel drawing on the wall

Table 1. Demographic characteristics of the participants

	M±SD
Age (years)	*23.79 ± 8.95*
Height (cm)	168.65 ± 8.40
Weight (kg)	66.20 ± 14.09
BMI (kg/m^2)	23.21 ± 4.14
Gender (%)	
Female	49(62,8)
Male	29(37,2)

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

Table 2. Comparison of ThePain, Posture, Performance and Energy Consumption Before and After Telerehabilitation

	Before Telerehabilitation Median (Min-Max)	After Telerehabilitation Median (Min-Max)	*Z*	*p*
Pain (Cm)	5(3-6)	2(0-4)	-6.854	<0.001*
Craniovertebral Angle (Degree)	50(12.6-48)	54,50(28-49)	3.208	0.001*
Eye Angle (Degree)	18,10(4-45)	21(1-40)	3.084	0.002*
Shoulder Angle (Degree)	53(2-89)	54(10-97)	1.076	0.282
Performance (meter)	550(193-798)	600(200-890)	6.245	<0.001*
Energy Consumption (Pulse. sn /m)	3.26(2.08-4.93)	2.32(1.08-3.95)	-0.870	0.384

Wilcoxon test, *p<0.05; Min: Minimum, Max: maximum,cm: centimeter,sn: second,m : meter

Table 3. Comparison of the Percent age difference of the Muscle Shortness between Before and AfterTelerehabilitation

MuscleShortness (%)	**Pre-Telerehabilitation**	**Post-Telerehabilitation**	**p**
Latissimus Dorsi			
Yes	36 (46.2)	46 (41)	**<0.001***
No	42 (53.8)	32 (59)	
Pectoralis Major Clavicular Part			
Yes	39(50)	44 (56.4)	**<0.001***
No	39(50)	34 (43.5)	
Pectoralis Major Sternal Part			
Yes	32(41)	28 (35.9)	
No	46(59)	50 (64.1)	**<0.001***
Pectoralis Minor			
Yes	65(83.3)	60 (76.9)	**<0.001***
No	13(16.7)	18(23.1)	

McNemar Test, *p<0.001

DISCUSSION

This study examined the effects of 12-week postural-based telerehabilitation on pain, posture, performance, and energy consumption of individuals with mechanic neck pain. As a result of this study, increases were detected in craniovertebral, shoulder and eye angles in the neck region and improvements in muscle shortness and performances in individuals with mechanic neck pain. No differences were detected in shoulder angles and energy consumption in mechanic neck pain between before and after telerehabilitation. To our knowledge, this study is one of the studies that study in the literature examining the effects of 12 weeks of postural-based telerehabilitation on pain, posture, performance, and energy consumption on mechanic neck pain.

Posture exercises, stretching and strengthening of neck muscles have positive effects on pain and disability in the treatment of the cervical region. Chen et al. (2016) demonstrated that telerehabilitation was useful in chronic neck pain promoting the desired outcome of increased range of motion in neck rehabilitation exercises by altering visual feedback. Özer et al (2021) showed that telerehabilitation provided positive gains on pain intensity, muscle endurance, postural alignment and disability levels. Similarly, this study results in the mean pain intensity that were statistically significant for before and after telerehabilitation. The authors think that postural improvements aftertel rehabilitation reduce the stress on the joints in the neck, resulting in a reduction in pain (Katz and Tenforde. 2020). Problem specific exercise programs improve muscle length, muscle flexibility (ROM), CVA., muscle strength, and reduce pain related symptoms (Yoo, 2013). Park et al.(2014) reported a positive effect on CVA and rounded shoulder posture when stretching and elastic bands were applied in addition to neck and chest muscle strengthening exercises. Also, another study showed that 16-weeks resistance and stretching training program

improved forward head and protracted shoulder postures in adolescents (Ruivo et al. 2017). Lynch et al (2010) studied the effects of an 8-week tele-exercise training program on the shoulder angle among 28 professional swimmers between 17-23 ages. Lynch et al (2010) applied an exercise program that was a combination of stretching and strengthening exercises that was performed 3 times a week. It was indicated that performing this training program had a positive effect on reducing the amount of forwarding head and shoulder angle. In this study, increase in CVA and eye angle was also found. However, there was no significant increase in SHA.

In the literature on mechanic neck pain studies, no consensus has yet been reached on the effect of mechanic neck pain on performance. Saeterbakken et al. (2017) showed that specific strength training for neck and shoulder pain in office workers reduced pain, but there was no change in 6-minute walk test. A few more studies demonstrated that on patients with nonspecific low pain using the Numeric Pain Rating Scale, Roland Morris Disability Questionnaire, and performance tests and found a moderate association between self-reported disability and performance-based assessment of functional disability (Nguyen and Randolf, 2017). Asiri et al (2021) proved a negative correlation with pain and functionalperformance. Duray et al (2018) showed that proprioceptive training is effective on motor performance in individuals with chronic neck pain. However, to the best of the researchers' knowledge, so far, it has not been reported any research on performance measurement in individuals with mechanic neck pain. This study results indicated that 6-minute walk test scores were improved significantly after telerehabilitation in individuals with mechanic neck pain.

When the mobility of the trunk is compatible with the movements of the cervical, thoracic and lumbar regions, coordinated movement occurs smoothly. The slightest problem in the cervical region has a negative effect on trunk mobility, and a coordinated, smooth trunk causes more muscle activation during movement. It has been reported that energy consumption is higher (about 40%) in individuals with disabilities and muscular problems, which cause worsened walking economy (Kamp et al. 2014). Kamp et al. (2014) showed that energy consumption increased as the functional status of disabled individuals deteriorated. Henchoz et al. (2015) determined that patients with low back pain adapt their motor control as a protective strategy against pain and increase energy consumption by increasing muscle activation in the lumbal region during walking. However, in this study there is no significant difference before and after telerehabilitation. Since there are no studies evaluating energy consumption related to neck pain in the literature, it is thought that this study will shed light on future studies. In addition, we believe that this is due to the fact that energy consumption is a difficult subject to investigate and interpret because it is affected by many factors.

It is known that the shortness of the muscles around the neck should be evaluated in cervical region pain (Durmuş B. 2014). As a result of the evaluations, it is aimed to correct the muscle imbalance by using strengthening exercises for the elongated muscles and stretching exercises for the shortened muscles. Stretching exercises provide elongation in the elastic component of the musculotendinous unit, thus it plays an active role in reducing muscle stiffness and pain (Cobanoglu et al. 2021). Price et al. (2020) showed the positive effect of stretching exercises on pain. Like previous literature, the results of this study showed that 12-week telerehabilitation improved muscle shortness significantly.

This study limits the generalizability of our results since only patients with moderate neck pain and disability were included. The authors believe that results of this study will shed light on future studies by increasing awareness about mechanic neck pain management. The authors anticipate the need for studies investigating the effectiveness of telerehabilitation programs in different sample groups.

In conclusion, this study proves that 12-week telerehabilitation program improves pain, posture, and performance in individuals with mechanic neck pain. Telerehabilitation can be suggested as an effective modality to decrease pain, improve posture and performance in individuals with mechanic neck pain.

Conflict of interest

The authors declare no conflict of interest. No financial support was received.

Ethics Statement

The approval of the Ethics Committee of Gülhane scientific research was obtained for the study (2022/03 ; 2022-80-17.02-2022).

Author Contributions

Study Design, TYŞ and DT; Data Collection, BNA; Statistical Analysis, BNA, MÖ; Data Interpretation, EY and TYŞ; Manuscript Preparation, SİU and DT; Literature Search, TYA, BNA, MÖ and SİU. 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

Assessment of Impact of new work postures adaptations of dentists on musculoskeletal discomfort by RULA and QEC

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Abstract
Objective: The concept on which the health care system is based is widely called Pd (proprioceptive derivation) or dp (derivations from proprioception) or “0” (zero) concept, centering on the positions, movements, contacts, and discomfort that we sense within our bodies as both providers and receivers of care. During the 1970s, Pd was used for health care records and skill acquisition, which can be applied anywhere in the world. The goal of this study was to evaluate and compare the impact of dental professionals' work postures on musculoskeletal problems by following Rapid Upper Limb Assessment (RULA) and Quick Exposure Check (QEC) while using conventional and proprioceptive derivation methodologies. Methodology: A questionnaire based study on dental clinicians' work postures analysis in dental institute and a symptom survey among dental clinicians working on both conventional and proprioceptive derivation ideas are the primary components of the study. Results: When musculoskeletal diseases among dental surgeons are compared between conventional and Pd work postures, a significant difference are detected. When asked if they felt any physical discomfort when doing oral prophylaxis, almost all of the doctors in Pd position said no. 100% of the clinicians observed that they applied the least force for scaling and polishing in PD posture. Conclusion: Adapting and practicing proprioceptive derived work postures resulted in less discomfort and least possible work-related injuries among dentists.

Keywords
Conventional Dental Chair, Dental Surgeons, Proprioceptive Derivation, Musculoskeletal Disorders, Work Postures

INTRODUCTION

The word "***proprioception***" has Latin roots and means "unconscious awareness of movement." It enables the body to adjust its position for the best possible movement. Internal sensors, like the muscle spindle stretch receptor and the golgi tendon organ, perform it. Proprioception and sustaining static, mixed, or dynamic balance both depend on the vestibular system of the brain. Balancing, movement sensing, and, natural tactile perception are all improved by proprioception training.

The positional relationship between the operator, the patient, and the setting, including instruments, is derived from the proprioceptive sense. Proprioceptive derivation (PD) is the term

Received: 22 February.2023 ; **Accepted:** 18 May 2023; **Online Published:** 28 May 2023
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How to cite this article: Pasupulet, MK., Lakshmi, PDN., Koneru, J., Pichika, S., Varma, PVK. and Amulya, KS. (2023). Assessment of Impact of new work postures adaptations of dentists on musculoskeletal discomfort by RULA and QEC. *Int J Disabil Sports Health Sci*;2023;6(2):161-170. https://doi.org/10.33438/ijdshs.1254324.

for it. Through masked eye exams and exercises, proprioceptive sensibility or feedback awareness can be increased. The ideal bodily circumstances and therapeutic environment are determined in the following order; a) proprioceptive sense; b) tactile sense; c) auditoryy sense; d) visual sense (Chaikumarn et al., 2004).

Proprioceptive derivation concept is validated till now only in dental profession with many research works related to sitting postures and work related musculoskeletal disorders (Chaikumarn et al., 2005; Nowak et al., 2016).

To meet patient requests and obtain finer outcomes, dental practitioners are subjected to a lot of physical effort. Modifying the workplace environment can help to avoid work-related musculoskeletal problems. The majority of dental treatments is time-consuming and need professional expertise to get the desired outcomes. To minimise needless tiredness in the dentistry profession, prior working circumstances such as the structure of the dental chair, the clinician chair, and the position of the clinician and the patient, motions throughout the operation, the kind of tools, and their use must be modified (García-Vidal et al., 2019; López-Nicolás et al., 2019).

The first of its kind, proprioceptive derivation (PD), a revolutionary approach of structuring a dentist workstation as well as working postures, was offered to dental students at Vishnu Dental College in India.

The primary goal of using Proprioceptive Derivation principles at the institutional level is to provide optimum accessibility, visibility, comfort, and control during dental treatments conducted by students. Applying the same at the post-graduate level and in clinical practise will aid in enhancing clinical work circumstances, which will improve the treatment outcome's efficiency.

Applying ergonomic principles to dental practice helped to some extent in preventing work-related musculoskeletal disorders, and the new method of proprioception has an adjunctive effect in preventing work-related disorders as well as clinician comfort, which increases treatment efficacy in any case (Abdolalizadeh et al., 2015; Lietz et al., 2018).

In dentistry, the proprioceptive, tactile, auditory, and visual senses all play a part in creating better circumstances for proper treatment. The operator, patient, and instrument design all interact to create the proprioceptive sense. The instruments should be placed in such a way that they do not interfere with the operator's typical working postures (Ohlendorf et al., 2017; Blanc et al., 2014).

A training programme called SATV (Skill, Acquisition, Training and Verification), which aids dentists in accumulating self-derived experience, is also coupled with the PD concept. The steps of skill acquisition, skill transfer, and skill verification make up the SATV system (Aman et al., 2015).

Dentists employ models for training during the skill acquisition phase. The highest conceivable level of clinical performance-compatible body positions and setting criteria are noted. These circumstances are thought to reduce physical strain during dental treatment. The SATV clinical environment is then modified using the derivations to account for the dentist's particular body dimensions for the best possible treatment delivery. The skill transfer phase emphasizes the potential clinical applications of the learned fundamental abilities, including oral examination, extraction, anesthesia, cavity restoration, root canal therapy, and crown and bridge preparation. A camera, digital video recordings, data forms, and standardized simulated pathologies of skill learning and transmission are used throughout the system for skill verification (Aman et al., 2015).

According to Terui, Iwao, and Taniguchi., 1997, the notion of Pd can provide dentists with a number of advantages by utilising SATV: The benefits of this technique include the following: 1. It establishes and maintains optimal finger control for precision work; 2. It minimises patient (care recipient) distraction; 3. It helps to maintain the dentist's spine's health; 4. It maintains consistent accuracy and reduces treatment time by eliminating unnecessary acts; (Terui et al., 1997). It establishes a foundation of infection control by reducing the number of finger instrument contacts (Ajay et al., 2013).

In regard to the treatment areas in the oral cavity, the dental practitioner must position himself around the patient. Typically, these are determined in respect to a 12-hour clock. However, slumped posture while sitting can lead to low back pain and other musculoskeletal diseases. In the convention sitting posture, it was not adequately explained how the spine must be

kept in a healthy posture with a little muscle strain (Ajay et al., 2013).

Patients with physical limitations can easily access Pd with a dental bed, which also helped clinicians to reduce physical stress on the muscles, especially in the shoulder and back regions, improve treatment accuracy, improve communication with patients and assistants, shorten treatment times, and increase high-quality control of infection by reducing the number of contacts with instruments. Hence, the goal of this study is to evaluate and compare the impact of dental professionals' work postures on musculoskeletal problems while using conventional and proprioceptive derivation methodologies.

MATERIALS AND METHODS

The human subject's ethics board of IECVDC/2021/F/PI/Q/42 dated 17-02-2021 authorized the research study, which was carried out by following the Helsinki Declaration of 1975, as updated in 2013. "The current cross-sectional study was done in VishnuDentalCollege, Andhra Pradesh, India, between June 1st and December 31st, 2021. Before beginning the study, permissions were acquired and the study objectives were explicitly described to all participants. To determine the feasibility and verify the questionnaire, a pilot research was conducted on a group of ten patients and doctors. Cronbach's alpha was found to be 0.75, which is acceptable.

The sample size was calculated using GPower 3.1 software at a level of significance set at 5%, power of the study 80% and for an expected effect size of 0.5 from previous studies by Chaikumarn, M et al., in 2004 and 2005. It was calculated that 64 sample per group were required to perform the study. So the sample size was rounded off to 70 per group.

In studies on dental health, the split-mouth design is frequently used. The right or left half of the dentition is randomly assigned to each of two treatments in this type of split-mouth study. The split-mouth design was used to divide a suitable sample of seventy patients (40 males, 30 females) between the ages of 20 and 55 into two groups, with 70 patients in each group needing treatment for gingival and periodontal disorders. Patients in Group A had non-surgical periodontal therapy performed on a conventional dental chair, whereas patients in Group B had non-surgical periodontal therapy performed on a proprioceptive dental support.

On the coin toss procedure, seven different doctors were assigned hand scaling of two quadrants on the traditional approach and two quadrants on the proprioceptive derivation approach.

The following are the inclusion criteria

1. Patients diagnosed with gingivitis or periodontitis, as defined by the AmericanAcademy of Periodontology (AAP) recommendations for 2018.
2. Patients must have a minimum of four teeth in each quadrant.

The following are the exclusion criteria

1. Patients with uncontrolled systemic illnesses
2. Patients above the age of 55 years.
3. Pregnant women and toddlers who require particular care.

All seven dental experts who had completed the proprioceptive derivation approach were required to practise seated work posture and four-handed dentistry with the assistance of a dental assistant. An observer trained in assessing the changes in adapting new work postures was included in this study. The observer used evaluation methods like QEC and RULA to compare the two techniques in terms of work postures, working time, comfort levels, and efficiency of non-surgical periodontal therapy conducted by dentists.

Quick Exposure Check (QEC)

All physicians should undergo a preliminary observation of sitting postures followed according to the proprioceptive derivation concept for at least one work cycle before assessing the posture (Gandavadi, 2008).

The back posture assessment was carried out while the back was at its most strained. The back has been classified as "Almost neutral," "Moderately flexed or twisted," and "Excessively flexed or twisted" if the individual is seen working with his or her back flexion/extension, twisting, or side bending less than 20^{o}, more than 20^{o} but less than 40^{o}, and more than 40^{o} but less than 60^{o} (Gandavadi, 2008).

Evaluation of shoulder and arm exposure

a) Shoulder/arm movement is deemed "infrequent" if there is no regular motion pattern. b) It is "frequent" if there is a regular motion pattern with occasional minor pauses. b) "Regular" if there is a consistent pattern of

movements throughout the workday (Gandavadi, 2008). Wrist and hand exposure assessment: The wrist is termed to be "almost straight" if its movement is limited to a small angular range (e.g. 15^{o}) of the neutral wrist posture. When performing the movement, the wrist is said to be "deviated or bent." (Gandavadi, 2008).

The neck is considered "excessively bent or twisted" if it is bent or twisted at an obvious angle (or more than 20^{o}) relative to the torso. QEC is considered to other assessment methods because it is a valid, sensitive, and trustworthy tool for assessing ergonomic risk is QEC. The QEC has the benefit that workers' tasks are not interrupted during the assessment, is adaptable for usage in a wide range of activities, and is simple to use. Numerous parameters that constitute musculoskeletal risk factors are taken into account by the QEC assessment. A closed set of questions used by QEC to examine the observer's observations and the respondent's responses ensures a high level of objectivity.

RULA – Rapid Upper Limb Assessment RULA (rapid upper limb assessment)

The range of motion of each body component is divided into sections and accurately recorded. Ranges of movement with few risk factors have the lowest score (Score 1), whereas ranges of movement with severe postures get higher scores (Score 2, up to 6) (Gandavadi, 2008).RULA is considered to other assessment methods because it is useful for measuring musculoskeletal hazards and upper-limb duties. It is also the greatest way for assessing outcomes like equipment fit and productivity. This approach works well for works that are primarily static and for training employees about high risk postures.

Expert in proprioceptive derivation concept was acted as single observer. (Corresponding author) The exposure scores were calculated by combining the observer scores and operators responses by QEC assessment method and grand total scores of RULA were given by the observer by assessing the upper arm, lower arm, wrist, neck and trunk positions while doing dental treatment in conventional and proprioceptive derived sitting postures. Microsoft Excel 2016 for Windows was used to enter the data. In each group, the frequencies and percentages of age were computed. The data was categorical, and the data was analysed using Pearson's chi-square test. Statistical significance was defined as a P-value of less than 0.05. The Statistical Package for Social Sciences, version 21.0, was used to analyse the data (IBM Corporation, Armonk, New York, USA).

RESULTS

Prior to the beginning of this study, we conducted a survey with equal number of males and females participants to know how many of the clinicians need to improve their clinical work environment. According to the findings, 50 percent (n=35) of the questionnaire respondents were male, whereas only 50 percent (n=35) were female. This might imply that both men and women want to improve their workplace health and behaviors.

Approximately 42.8 percent of dentists said they work 8 hours or more per day, while 57.2 percent said they work 4-7 hours each day. When working in a traditional dental chair, 14.2 percent of dentists work without taking any rest breaks, 71.4 percent take rest breaks less frequently, and 14.2 percent take rest breaks more regularly. When working on proprioceptive support, 28.5 percent of dentists work without taking any rest breaks, 58.5 percent take rest breaks less frequently, and 12.8 percent take rest breaks more frequently (Table.1).

According to the findings of this study, 64.2 percent of dentists working in traditional dental chairs had musculoskeletal discomfort and, as a result, musculoskeletal dysfunction. Only 32.8 percent of dentists working on proprioceptive designed assistance reported musculoskeletal discomfort development. In comparison to proprioceptive-derived support, this shows that musculoskeletal diseases are the most prevalent health concern among dentists practising on traditional dental chairs (Table.1).

According to the findings of this study, the hand (30%), neck (28.5%), back (28.5%), wrist (11.4%), and shoulder (1.42%) were the most often afflicted body parts as a result of lengthy working hours in a traditional dental chair. When dentists used a proprioceptive derived method, the portions impacted in decreasing order were the shoulder (54.2 percent), hand (38.5 percent), neck (2.85 percent), wrist (2.85 percent), and back (1.42 percent) (Table.1).

Table 1. Comparison between the clinician's responses while working on conventional and Pd work postures

SL.NO	Question	Options	Conventional	Pd	Chisquare	p-value
1	Years of work experience as dentists on both conventional and Pd Support	≤ 2 years	0	30	46.694	0.000*
		≥2 years	70	40		
2	Time spent working on patients per day.	>8 hours	30	30	2.778	0.09
		4-6ours	40	40		
3	Frequency of rest breaks taken while working on conventional and Pd Support	No breaks taken	10	20	64.542	0.000
		Less frequent	50	41		
		More frequent	10	9		
4	Any musculoskeletal or medical problems reported while working on conventional and Pd Support	Yes	45	23	1.175	0.001
		No	25	47		
5	Of the following, the most common part of the body affected due to long working hours	Neck	20	2	34.681	0.001
		Wrist	8	2		
		Hand	21	27		
		Back	20	1		
		Shoulder	1	38		
6	Are you satisfied with the training on operating positions in your undergraduate and postgraduate level	Yes	43	55	21.778	0.001
		No	27	15		
7	Have you ever faced any musculoskeletal discomfort while performing oral prophylaxis	Yes	60	15	36.781	0.000
		No	10	55		
8	Do you observe any change in the application of Force used for scaling and polishing by application of two different work postures:	Least force	3	70	9.876	0.001
		Medium force	65	0		
		Extreme force	2	0		
9	Do you report any pain after oral prophylaxis following two different work postures	Yes	63	25	66.78	0.000
		No	7	45		
10	In which of the following approaches you notice comfortable position, [Upper arm, lower arm, wrist, neck, leg, feet]	Yes	0	70	11.698	0.001

The Exposure evaluation for the back was practically neutral for nearly all of the participants. Static postures held for more than a minute, repeated more than four times per minute were not statistically significant for any of the subjects. There was a favorable effect in that the majority of doctors believed PD work postures were pleasant, and they discovered that adopting Pd work postures resulted in a reduction in musculoskeletal problems (Table.2).

Table 2. Assessment of QEC (1 to 4 questions) and RULA (5 to 9 questions) of 7 clinicians performing scaling on 70 patients in a split-mouth design.

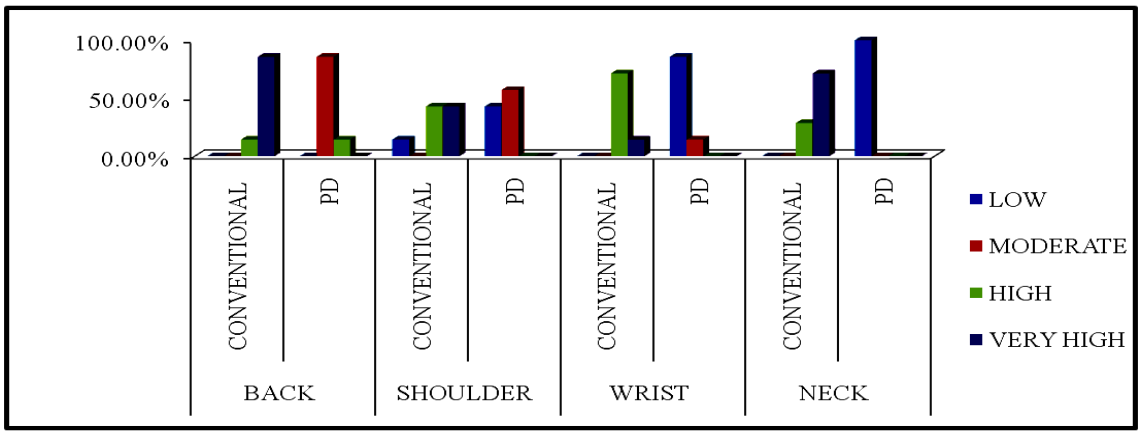
SL. No	Question	Options	Conventional	Pd	Chisquare	p-value
1	Exposure assessment for the back:	Almost neutral	0	7	14.000	0.001
		Moderately twisted	3	0		
		Excessively twisted	4	0		
2	Exposure assessment for the shoulder:	Infrequent	0	7	14.00	0.001
		Frequent	4	0		
		Very frequent	3	0		
3	Exposure assessment for the wrist/hand:	Almost straight	0	7	14.000	0.000
		Deviated	7	0		
		Bent	0	0		
4	Exposure assessment for the neck:	Bent(less than 20 degrees)	0	7	14.00	0.001
		Excessively bent(more than 20 degrees)	7	0		
5	Range of movements recorded for upper arm, lower arm, and wrist.	Flexed	1	1	12.000	0.002
		Straight vertical	0	6		
		Straight inclined forward	6	0		
		Inclined backward	0	0		
		Neutral	0	0		
6	Range of movements recorded for Neck, Trunk, and Legs	Flexed	0	7	14.000	0.001
		Straight vertical	7	0		
		Straight inclined forward	0	0		
		Inclined backward	0	0		
		Neutral	0	0		
7	Postural score on a scale of 1-9 (1 being least musculoskeletal loading)	1	0	0	14.09	0.007
		2	0	2		
		3	0	5		
		4	0	0		
		5	0	0		
		6	2	0		
		7	4	0		
		8	1	0		
		9	0	0		
8	Muscle use: Static postures held for more than a minute, repeated more than 4 times per minute	Yes	7	0	14.000	0.001
		No	0	7		
9	Force: Total hours of work done in a day	Score 1 for more than 4 hrs less than 6 hrs	1	7	7.778	0.02
		Score 2 for more than 6 hrs	6	0		

By using the quick exposure check (QEC) and Rapid Upper Limb Assessment (RULA) instruments, one trained observer on the proprioceptive concept examined the work postures of seven operators working on both the conventional and the proprioceptive concept. While adopting proprioceptive derived work postures, the observer also noticed changes in the exposure scores of back, shoulder, wrist and neck parts (Table 3, Graph 1).

Table 3. Describes the total exposure scores given by the observers and the operators in conventional and proprioceptive derived sitting postures

QEC PARAMETERS	GROUP	Mean	Std. Deviation	P Value
BACK	CONVENTIONAL	51.7143	7.78276	.000
	PD	27.4286	3.59894	
SHOULDER	CONVENTIONAL	37.4286	9.43146	.001
	PD	21.1429	1.06904	
WRIST	CONVENTIONAL	39.1429	3.02372	.000
	PD	20.5714	.97590	
NECK	CONVENTIONAL	16.0000	1.63299	.000
	PD	4.5714	.97590	
OPERATOR SELF SCORE	CONVENTIONAL	14.1429	2.67261	.000
	PD	4.2857	1.60357	

Graph 1. Comparison of exposure levels assessed by QEC method in conventional and proprioceptive concept sitting postures

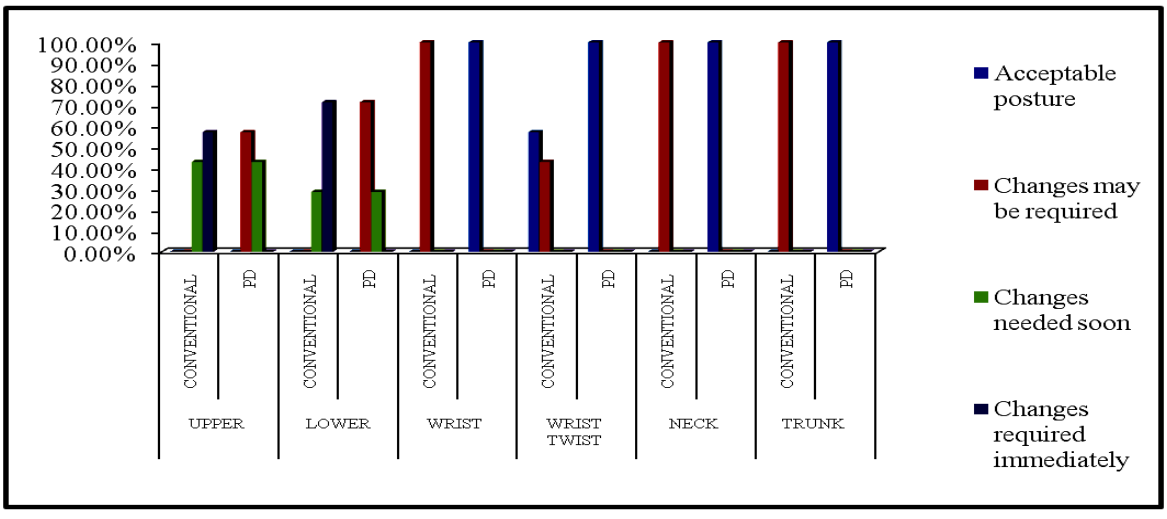


When musculoskeletal issues among dental surgeons are examined between traditional and PD work postures, a significant difference are discovered. When asked if they felt any musculoskeletal discomfort when conducting oral prophylaxis, almost all of the doctors in PD posture said no, and 100 percent of the clinicians said they had no effect on wrist, neck and trunk when done scaling and polishing in Pd position (Table.4, Graph 2).

Table 4. Describes the grand total scores given by the observers in conventional and proprioceptive derived sitting postures

RULA PARAMETERS	GROUP	Mean	Std. Deviation	P Value
UPPER	CONVENTIONAL	6.5714	.53452	.000
	PD	4.2857	.75593	
LOWER	CONVENTIONAL	6.7143	.48795	.000
	PD	4.1429	.69007	
WRIST	CONVENTIONAL	3.5714	.53452	.000
	PD	1.7143	.48795	
WRST TWIST	CONVENTIONAL	2.4286	.53452	.001
	PD	1.2857	.48795	
NECK	CONVENTIONAL	3.7143	.48795	.000
	PD	1.7143	.48795	
TRUNK	CONVENTIONAL	3.7143	.48795	.000
	PD	1.5714	.53452	

Graph 2. Comparison of Action levels required by RULA assessment method in conventional and proprioceptive concept sitting postures



DISCUSSION

Dentists' working posture is always important in the industry since it helps them perform better. Work-related musculoskeletal problems emerge when working posture is altered in any way (Nguyen et al., 2004) It is critical to adjust dentists' work postures when working in dental clinics in order to enhance their lifespan in the field. The findings of this investigation revealed that switching from a traditional to a Pd work posture resulted in a noticeable distinction in comfort and treatment satisfaction. These findings are from (Chaikumarn's et al., 2005) observational study of dentists who use Pd and (Chaikumarn et al., 2004).

Dental advancements and modifications, such as the proprioceptive derivation (Pd) idea, aimed to provide dental experts with greater comfort and improved health. By adopting the proprioceptive concept, dentists can work more comfortably and effectively compared to the traditional approach.

RULA was used by Nguyen et al., 2004 to assess dentists' working posture. The RULA method was used to watch, question, and assess 19 dentists and dental assistants. The dentists' working posture was found to be abnormal, with static and prolonged sitting, lifted shoulders, bent and twisted necks, and a bowed trunk that needed immediate attention (Nguyen, 2004). Chaikumarn et al., 2005 used RULA to look at how dentists' working posture changed when they used alternative work concepts like proprioceptive derivation (Pd) vs the standard approach. The Pd concept is a strategy that helps dentists to keep a good posture while performing dental tasks, hence decreasing musculoskeletal pain.

The primary reasons for employing Pd were that it increased comfort, improved treatment satisfaction, improved communication with assistants, increased instrument availability throughout treatment time, and reduced contact with chair/support components, according to the findings. These are in line with Hendrick HW's 2003 book, Principles and Applications in Occupational Ergonomics (Hendrick et al., 2003). This study provided optimal access and visibility, comfort, and control during clinical practise, which is an important component of dental ergonomics. These conclusions are based on Pollack R's findings from 1996 (Pollack et al., 1996). The Ergonomic Work Analysis approach was introduced in a Brazilian dentist's office by Custodio, R. et al. in 2012. The analysis helped identify the restrictions and ways to get around them. The position recommended by the International Organisation for Standardisation (ISO) and the Federation Dentaire Internationale (FDI) was found to be hardly ever used by dentists.

The use of ergonomic stools with lumbar support in conjunction with proprioceptive-derived supports has grown over time, demonstrating comfort in the workplace for dentists and lowering work-related musculoskeletal problems (MSDs). These are the results of Custodio's R study, which

was completed in 2012 (Custodio et al., 2012). Pîrvu et al. (2014) did a study to examine the position dental professionals adopt when working, starting with a balanced posture and moving on to other posture variants. By lowering tiredness and restricting workspace, these measures have been advocated to avoid these prevalent MSDs, and the current study also suggests that modifying work postures and workspace might result in preventing work-related diseases in dentistry.

Kumar et al., 2020 conducted a study to assess the dental student knowledge, attitude, and practice toward ergonomics in three different dental schools. The results of the study shown that ergonomic education of the dental health-care personnel must be focused in all the educational institutions and at continuing dental health programs by delivering ergonomic principles both theoretically and practically and should be a part of the curriculum. The current study results also explained that by following the work postures appropriately one can prevent MSDs. (Belenky et al., 1998) The findings show that there is a statistically significant difference in risk rankings between proprioceptive and traditional dental chairs.

A systematic review was conducted on the available literature to clarify the advantages of the proprioceptive derivation over the conventional approach. The proprioceptive derivation strategy was able to keep the upper limb, trunk, and lower limb joints in an appropriate position, resulting in a good working posture (Pasupuleti, 2023).

Conclusion

When applied to dental doctors' work postures, the RULA and QEC methodologies allowed for a quick assessment of their posture throughout the shift from conventional to proprioceptive derivation principles. These evaluation methods revealed that proprioceptive-derived work postures may maintain an appropriate working position over time, but traditional work postures decline with time, potentially predisposing to the development of musculoskeletal disorders.

Acknowledment

This project was supported by the research team of VishnuDentalCollege, Bhimavaram, Andhra Pradesh, India

Conflict of interest

The authors declare no conflict of interest. No financial support was received.

Ethics Statement

The human subject's ethics board of IECVDC/2021/F/PI/Q/42 dated 17-02-2021 authorized the research study, which was carried out by following the Helsinki Declaration of 1975, as updated in 2013.

Author Contributions

Study Design, MKP and PDNL; Data Collection, JK and SP; Statistical Analysis, MKP, PVKV; Data Interpretation, SP and KSA; Manuscript Preparation, MKP, JK and KSM; Literature Search, PDNL, JK, SP and KSM. 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

Physical activity based on manipulative exercise: how it affects the gross motor of children with autism for 12 years old?

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Abstract
This study aims to determine the effect of manipulative exercise on gross motor ability in students with grade V autism at SDLB who are 12 years old. The method and design used in this study is single-subject research using an Applied Behavior Analysis (ABA) design. Researchers use test techniques in the form of instruments that use an event score recording system by providing checks/notes on paper that have been provided for each event or behavior that occurs up to a predetermined period. Data collection is carried out by observation and documentation techniques which are then analyzed using visual analysis under conditions. The results of this study provide a conclusion that manipulative exercises have an influence on the gross motor ability of students with autism, so manipulative exercises can be used as an alternative to improving gross motor ability. This success may be influenced by several other factors that limit this study such as social, cultural, linguistic, and possibly even genetic characteristics that can be used for further study. The recommendation for further research is to conduct further research by paying attention to the limitations of this research.

Keywords
Physical Activity, Manipulative Exercise, Gross Motor, Children, Autism

INTRODUCTION

Motor development includes fine motor and gross motor. Gross motor development is important because it affects other developmentsto optimize motor skills, practice is required (Burns et al., 2017a). Motor skills will not develop in the absence of the maturity of motor control, motor control will not be optimal without body fitness, and body fitness will not be achieved without physical exercise. Motor skills, especially gross motor skills, are very important to be mastered by children because with gross skills children will be able to carry out their daily activities and be useful for their growth and development in the future (Azizah et al., 2022; Gil Madrona et al., 2014). Without good movements, children will lag behind others, including autism.

In an autistic child, if he is given good motor exercises, then his motor development will be good anyway. Training motor skills in autistic children aims to make their motor nerves develop optimally (Phytanza, Burhaein, et al., 2021; Phytanza, Purwanta, Hermanto, Burhaein, et al.,

Received: 01 March.2023 ; **Accepted:** 23 May 2023; **Online Published:** 30 May 2023
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How to cite this article: Phytanza, DTP., Burhaein, E., Lourenço, CCV. and Pavlovic, R. (2023). Physical activity based on manipulative exercise: how it affects the gross motor of children with autism for 12 years old?. *Int J Disabil Sports Health Sci*;2023;6(2):171-180. https://doi.org/10.33438/ijdshs.1258177

2021). Motor nerves can be trained and developed through regular ongoing activities and stimuli. Motor skills in a child must be trained and developed early. Motor exercises can be done with initial basic motion exercises, namely locomotor motion, nonlocomotor motion and manipulative motion (Healy et al., 2018).

Motor skills can develop in line with the maturity of the brain and nerves. Therefore, every movement that a child makes, even though it is simple, is actually a result of the interaction patterns of various complex system parts in the body that are controlled by the brain (Phytanza, Purwanta, Hermanto, &Burhaein, 2021; Phytanza& Burhaein, 2019). The brain serves to control and regulate all the physical and mental activities of a person. Gross motor movements are in the form of body movements related to large muscles such as running, kicking, tiptoeing, jumping, catching, throwing, and maintaining balance. Such activities are necessary to improve the coordination skills of gross motor movements.

The development of gross motor movements is closely related to physical or physical activity that uses large muscles (Burhaein et al., 2021; Burns et al., 2017b). These large muscles such as shoulder muscles, arm muscles, leg muscles, abdominal muscles, and back muscles are affected by physical maturity and these movements can usually be done by children (Burhaein et al., 2020; Mokhamad Parmadi Agus Setia Budi Wisnu Murtiansyah Ari Susanto, 2022). In everyday life, gross motor movements can be seen or encountered when seeing a child is playing. Examples of gross motor movement skills performed by children at the time of such as children playing chasing by running, jumping, jumping, or playing ball by kicking, throwing, and bouncing it. The movement is strongly influenced by the physical and psychic development of children with autism.

Gerak motorik kasar biasanya memerlukan lot of power, as it is done by large muscles. Gross motor movements involve the activity of the muscles of the legs, muscles of the hands, and the whole body of the child. Gross motor movements are influenced by maturity in coordination. Various kinds of gross motor movements that can be achieved by children will be very useful for their future lives. For example, children are accustomed to kicking balls and running, if they grow up, they will enjoy exercising. If he likes to exercise, his muscles will be stronger and his immune system will increase and will avoid various diseases. On the contrary, if motor skills are not developed then the problem will increase and expand as the child ages. For example, if the initial basic movements such as locomotor motion, non-locomotor motion and manipulative motion are not trained, it can result in the child showing awkward and rigid movements due to lack of coordination or frequent falls while walking.

In Yogyakarta, Indonesia there is a special school to deal with children with autism, the name of the school is the extraordinary school (SLB) "X". Within the school there are several classes, ranging from early intervention classes consisting of behavioral therapy classes, occupational therapy classes, and speech therapy classes. Other classes found in SLB "X are kindergarten classes (TKLB), transitional classes and classes for the elementary school level (SDLB). Transition classes are preparatory classes to prepare students with special needs (autism) to be able to participate in learning activities together with students in general. Autistic students attend special schools using the Indonesian independent curriculum which has been modified according to their abilities and needs.

One of the autistic children who attended SLB "X" is a "BS" student, he is in class V of SDLB and is 12 years old. According to the results of observations that have been made by researchers at SLB "X" shows that the gross motor ability "BS" still needs to be optimized. It can be seen when throwing and catching the ball. He seemed to hesitate when he was about to catch the ball. The ability to throw the ball is also not good, he has not been able to make the movement of throwing the ball correctly, because he seems to throw the ball down instead of doing the movement throwing the ball correctly, namely throwing forward or upwards. "BS" also hasn't been able to jump, bend over and tiptoe using both legs. The sports activities participated by "BS" at SLB "X" include gymnastics which is carried out every day before eating at school, throwing catch the ball, dexterity training, and ball kicking exercises. The way teachers teach ball catch throwing is to do the practice of throwing catch the ball directly in a standing position. At first, the teacher instructs "BS" to stand up and place the "BS" into the throwing area to catch the ball, then the teacher gives the instruction "BS, catch the ball!" and then BS

catches the ball. And at the time of throwing the ball, Master gives the instruction "throw the ball!" then BS throws the ball held by him. If at the time of throwing catch the ball BS encountered obstacles, then the teacher providedassistance.

Based on this description, there is a focus on the effect of manipulative exercise on gross motor ability, which is formulated in the research question, namely, how does manipulative exercise affect the gross motor ability of students with autism class V SLB "X"? So the purpose of this study was to analyze the effect of manipulative exercise on the gross motor ability of students with autism class V SLB "X".

MATERIALS AND METHODS

Research Method

In the research conducted, researchers use quantitative methods with a type of single-subject research (SSR) namely experimental research using single-subject research to find out how much influence a treatment is given to subjects. Single Subject Research is a study that focuses on behavioral changes in the cognitive, psychomotor, and affective realms caused by behavior/action/intervention in one subject being studied (Gast, 2009; Horner et al., 2005; Peng, 2020). The data in this study were obtained through experimental techniques, namely, the research was carried out using two variables, namely free variables and bound variables which then tested the influence of independent variables on dependent variables. In this study, the single subject of the field of behavior modification into bound variables is the target behavior that wants to be changed by providing certain actions or interventions.

In Single Subject Research, there are three kinds of research designs, namely: 1) A-B design, 2) A-B-A design, and 3) A-B-A-B design. The A-B-A design is one of the developments of the basic A-B design. This A-B-A design shows a stronger causal relationship between free variables than the A-B design. The design used in this study was the A-B-A design. Measurements in the A-B-A design are carried out by comparing the first baseline condition (A1) with a certain period of time and then measurement at the intervention condition (B) at a certain period, followed by re-measuring in the second baseline condition (A2) at a certain period as a change to know or convince the existence of a strong functional relationship between the free variable and the stronger bound variable, So that a conclusion can be formulated from the results of these measurements.

Participants

This study was conducted on one autistic child of grade V SDLB, aged 12 years who attended SLB "X" with the initials BS. The initial ability that the child has is quite good, namely compliance behavior has been formed. His gross motor skills are still lacking, it can be seen when researchers make observations at SLB "X". It can be seen when throwing and catching the ball. He seemed to hesitate when he was about to catch the ball. The ability to throw the ball is also not good, he has can't make the movement of throwing the ball correctly, because he seems to throw the ball down, not doing the movement of throwing the ball correctly. BS also hasn't been able to jump, bend down, and tiptoe using both legs. From the results of this study, the intervention of subjects with autism is expected to be able to improve gross motor abilities through manipulative exercises so that later their motor nerves can develop optimally.

Instruments

As previously stated, this research is a quantitative study with the type of Single Subject Research which was carried out to improve gross motor ability in grade V students with autism using manipulative exercises at SLB "X". Researchers use a test technique in the form of an instrument that uses an event score recording system by providing a check/noteon the paper that has been provided for every event or behavior that occurs up to a predetermined period. To get the desired data, then pay attention to the following:

1. Definition of Conceptual

Gross motor ability is the ability of students to perform gross motor movements that require coordination of most parts of the body and are more demanding on physical strength and balance in the form of movements involving large muscles.

2. Definition of Operational

Gross motor ability is a score obtained by students after a test. This score describes the learner's ability to perform movements involving large muscles, including (1) rolling the ball using two hands, (2) passing the ball using two hands and (3) catching the ball using two hands.

3. ***Lattice - Instrument Grille***

The stages of compiling student instruments are to compile a grid in the form of a specification table based on variables.

Table 1. Gross motor capability instrument grilles in class V learners with autism in SLB "X"

Variable	Aspects	Indicators	Item Number	Sum
Ability Gross motor	Strength big muscles	1. Learners are able to roll the ball using two hands well	1	1
		2. Learners are able to pass the ball using two hands appropriately	2	1
		3. Learners are able to catch the ball using two hands well	3	1
		Total	**3**	**3**

Grade Criteria

1. If the subject is able to perform movements independently is given a score of 3;
2. If the subject is able to perform movements with little help is given a score of 2;
3. If the subject is able to perform movements with the help of all of them is given a score of 1.

Data Collection Technique

The data collection technique carried out in this study is a test. Researchers used the deed test on subjects starting from the first baseline (A1), intervention (B), and second baseline (A2). The first baseline (A1) aims to determine the outcome of the subject's ability before obtaining an intervention. The second baseline test (A2) is useful for obtaining the results of the subject's abilities after obtaining the intervention.

1. First Baseline Phase (A1)

This phase is the initial condition of the gross ability of motor in the subject before receiving treatment. From here the researchers looked at the ability of the gross motor to roll, pass the ball and catch the ball to the learners without being given any treatment and recorded what the learners did. This first baseline phase is carried out repeatedly until the learner's state stabilizes, to find out the initial abilities that the subject has before being given treatment using manipulative exercises. More details can be seen in Figure 1.

2. Intervention Phase (B)

It is an intervention condition of the gross motor ability of the subject during the treatment process. The intervention is carried out using manipulative exercises aimed at helping to improve gross motor abilities. This stage of intervention is carried out repeatedly until the subject can perform this stage to the maximum until it stabilizes. To measure the gross motorability of subjects are taughtmanipulative exercises. Manipulative exercises consist of 4 stages, namely, the first stage (basic) of rolling the ball, the second stage of bouncing the ball, the third stage of passing the ball, and the fourth stage of catching the ball which is carried out in a standing position. More details can be seen in Figure 1.

3. Phase A2 (Second baseline)

This stage is the stage of adding conditions for drawing conclusions. In this stage, students perform movements to roll the ball, throw the ball and catch the ball after manipulative exercises are carried out in the previous stage, namely the intervention phase (B). More details can be seen in Figure 1.

Information

A. A1 is the symbol of the flat line (first baseline). The first baseline is a natural initial condition of the subject without intervention.

B. B (intervention) is an intervention in which the subject is given repeated treatment.

C. A2 (baseline kedua) merupakan pengulangan kondisi A1 yang dilakukan sebagai evaluasi bagaimana intervensi berpengaruh terhadap subyek.

Data Analysis

In Single Subject Research, data analysis uses simple descriptive statistics and focuses on individual data influenced by the design used. This study used an A-B-A design with data processing techniques using percentages. A percentage is a unit of measure that is often used by researchers and teachers to measure behavior in academic and social fields. Percentage (%) is calculated by calculating the maximum score multiplied by 100%.

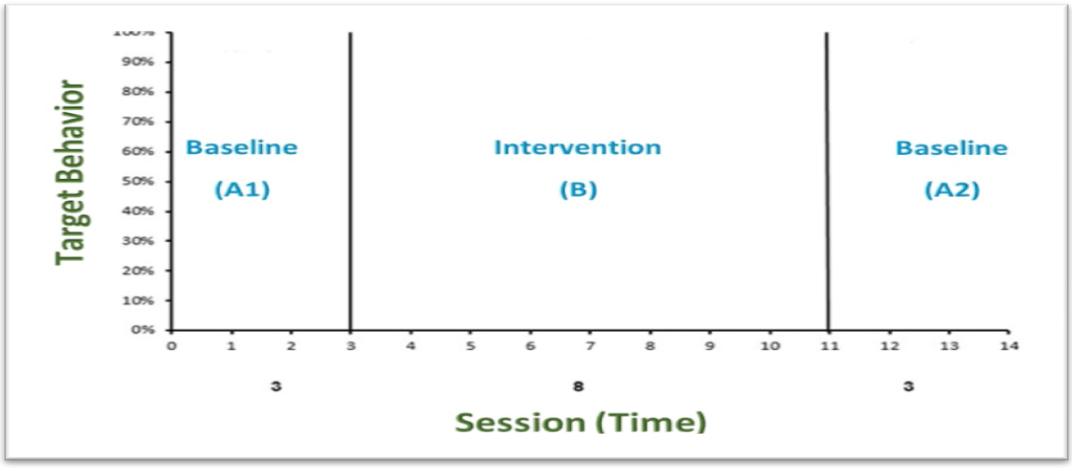

Figure 1. Data collection technique flow

Percentages = $\frac{\Sigma \text{ Acquired ability score}}{\Sigma \text{ maximum score}}$ x 100%

The analysis in this study uses visual analysis in conditions. Visual analysis in conditions is an analysis carried out by making direct observations of the data that has been displayed in the graph. The analysis components under conditions include six components, namely 1) Length of condition, 2) Estimated directional tendency, 3) Stability tendency, 4) Data footprint, 5) Level of stability and 6) Range / level of change. The steps for determining the six components of visual analysis under conditions based on this study are as follows:

1. Step 1: Specify a condition length that indicates the session in each condition or stage. In this study using disai A-B-A with the length of the condition at the first baseline (A1) was 3 sessions, the intervention (B) was 8 sessions and the second baseline (A2) was 3 sessions.
2. Step 2: Estimate the trend of the direction using the split middle method on the graph, and then determine the trend line in the table that describes the downward, horizontal or ascending direction of the behavior being intervened in each session that needs to be measured. More details can be seen in Figure 2.
3. Step 3: Determine the stability tendency at stages A1, B, and A2 towards the measured behavioral targets. The percentage of stability is said to be stable if it is 85%-90%, while below that the variable is unstable. The percentage of stability at each stage is known by first determining the tendency to stability using the 15% stability criterion through calculations for each stage below:
   a. Stability range = highest data x 15%
   b. Mean level = total number of data: the amount of data.
   c. Mean level = total number of data: the amount of data.
   d. Lower limit = mean – half the stability range.
   e. Stability percentage = many data in the range: many data
4. Step 4: Determine the trend of traces at stages A1, B, and A2 towards each of the measured behaviors. It is the same as determining the directional trend.

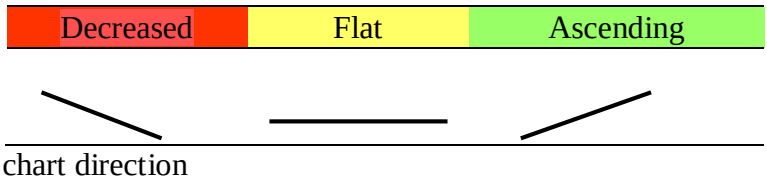

Figure 2. Trend of the chart direction

5. Step 5: Determine the level of stability and range by writing down stable or variable data results and the range of data from the smallest data to the largest data at each stage.

Step 6: Determine the level of change by marking the first data and the last data at each stage. Then determine whether thedirection is increasing or decreasing by putting a sign (+) if it improves, (-) if it worsens, and (=) if there is no change. After knowing the calculation results of the six components analyzed, foBSat can be made or a summary table of the analysis results under conditions that can be used to describe the results of the study.

RESULTS

Baseline Stage Data Description (A1)

Before the researcher gave the treatment (intervention), the researcher made observations (data collection) about the gross motor ability of learners with class V autism in SLB "X". The purpose of observation is to measure and collect data on the gross motor ability of the subjects before the treatment (intervention). Observation is carried out by observing and recording the gross motor ability of the subject during sports activities.

At the baseline stage (A1), researchers measured and collected data on the subjects' initial motor gross ability without being given intervention. Measurement and data collection of target behavior 46 was carried out in three sessions, namely Monday, Wednesday, and Friday in the second week of August 2022 with a duration of 45 minutes in each session starting at 09.15 to 10.00 WIB. The score gain at this stage can be seen in the following table.

Table 2. Baseline condition stage score acquisition (A1)

Gross Motor Capability	Session			Average
	1	2	3	
1. Able to roll the ball using two hands well.	1	1	1	**1**
2. Able to roll the ball using two hands well.	1	1	1	**1**
3. Able to catch the ball using two hands well.	1	1	1	**1**

The data in the baseline condition stage score acquisition table (A1) showed that in sessionsone to session three, the average score obtained by the subjects at the baseline stage (A1) was 1 for each ability, namely rolling the ball, passing the ball, and catching the ball. In accordance with the description of the score obtained that has been described in the previous chapter, a score of 1 indicates that the subjects were fully assisted by the researcher in performing gross motor movements.

Based on the results of measurement and collection of target behavior data in the baseline condition stage score (A1) acquisition table conducted for 3 sessions, these results showed that students with grade V SDLB autism hade low gross motor ability. The results also show that the data has reached a stable level. Thus, the study can be continued to the next stage, namely the intervention condition (B).

Description of Intervention Stage Data (B)

The intervention stage (B) is a condition of gross motor ability intervention, that is, in the form of treatment given to subjects through manipulative exercises. The manipulative exercise begins with rolling the ball on the floor using two hands, then bouncing the ball to the floor using two hands, followed by passing and catching the ball using two hands which are done in a standing position. Intervention through manipulative exercises is carried out to determine changes in the gross motor ability of the subjects.

Intervention condition (B) was given to subjects in as many as eight sessions. The number of sessions conducted each week is 3 meetings on Monday, Wednesday, and Friday. Intervention conditions (B) were implemented in total at 8 meetings. The duration for each meeting is 45 minutes, starting at 09.00 WIB until 09.45 WIB. The score acquisition at this stage can be seen in the following Table 3.

Table 3. Acquisition of intervention condition stage score (B)

Gross Motor Capability	Session								Average
	1	2	3	4	5	6	7	8	
1. Able to roll the ball using two hands well.	2	2	2	2	2	3	2	2	**2,12**
2. Able to pass the ball using two hands appropriately.	2	2	2	2	2	2	2	2	**2**
3. Able to pass the ball using two hands appropriately.	2	2	2	2	3	2	2	2	**2,12**

The data in the table of obtaining the score of the intervention condition stage (B) shows that gross motorability in students with grade V SDLB autism has increased. The increase in gross motorability occurs in the ability to roll the ball, pass the ball and catch the ball. The average score obtained is 2.12 for the ability to roll the ball and catch the ball, while for the ability to pass the ball the average score obtained is 2. Based on these results, the provision of intervention in this intervention condition (B) can be stopped in the eighth session because the data on the intervention condition (B) is stable and can be continued to the second baseline stage (A2).

Baseline Stage Data Description (A2)

After treatment at the intervention condition (B), the next stage is the baseline stage (A2). The baseline stage (A2) is the repetition phase of baseline condition A1. The purpose of continuing to the baseline stage (A2) is to find out or convince that there is a strong relationship between the free variable (manipulative exercise) and the bound variable (gross motor ability), namely by repeating in measuring and collecting data on the gross motor ability of the subject without intervention.

Research at the baseline condition stage (A2) was carried out by observing and recording the gross motor ability when the subjects performed gross motor movements, namely rolling the ball on the floor using two hands, passing the ball using two hands, and catching the ball using two hands. At this stage, measurement and data collection are carried out in as many as three sessions, namely on Monday, Wednesday,and Friday. Phase A2 was carried out in total in 3 meetings with a duration of 45 minutes. The A2 condition stage starts at 09.00 to 09.45 WIB. The score at this stage can be seen in the following Table 4.

Table 4. Baseline condition stage score acquisition (A2)

Gross Motor Capability	Session			Average
	1	2	3	
1. Able to roll the ball using two hands well	3	3	3	**3**
2. Able to pass the ball using two hands appropriately.	2	2	2	**2**
3. Able to catch the ball using two hands well.	3	3	3	**3**

The data in the baseline condition stage score (A2) table shows that the gross motor ability of learners with grade V SDLB autism has changed (increased) from the intervention condition stage (B). This can be seen from the average score obtained by the subjects is 3 on the ability to roll the ball and the ability to catch the ball. In accordance with the description described in the previous chapter, a score of 3 indicates that the subject is able to roll the ball and catch the ball independently. As for the ability to pass the ball precisely, the results of measurements and data collection show that the ability to pass the ball has not changed (stable) from the stage of intervention condition (B). The average score obtained is 2 which means the subject is able to pass the ball precisely with little help.

Based on the score acquisition data at the baseline condition stage (A1), the interventioncondition stage (B) and the second baseline condition stage (A2) researchers can draw the conclusion that manipulative exercise has an influence on the gross motorability of learners with grade V SDLB autism.

From this analysis, the researcher can decide to stop the study until the second baseline condition (A2) stage because the data obtained is stable and the target has been achieved even though there is one gross motor movementthat still needs a little help, namely passing the ball correctly. From the data obtained from recording gross motor ability scores on the first baseline (A1), Intervention (B), and second baseline (A2), researchers compared these data and saw changes in gross motor abilityafter intervention using manipulative exercises. This can be seen in the following Table5.

DISCUSSION

Based on the results of the study, manipulative exercise has an influence on gross motor ability in grade V SDLB students with autism. This can be seen from the change in score acquisition which shows that the score gain at the intervention stage (B) has increased when compared to the measurement results and score acquisition at the first baseline stage (A1).

Table 5. Score acquisition of baseline condition stage (A1), intervention condition stage (B), and second baseline condition stage (A2)

Condition Stage	Session	Motor Gross Capability Score		
		Able to roll a ball well	Able to pass the ball appropriately	Able to catch the ball well
A1	1	1	1	1
	2	1	1	1
	3	1	1	1
B	1	2	2	2
	2	2	2	2
	3	2	2	2
	4	2	2	2
	5	2	2	2
	6	2	2	3
	7	2	3	2
	8	2	2	2
A2	1	2	3	3
	2	3	2	3
	3	3	3	2

Likewise, the score acquisition at the second condition stage (A2) has increased when compared to the score acquisition at the intervention condition stage (B).

The results of providing intervention conditions (B) through manipulative exercises showed that the acquisition of gross motor (gross motor) ability scores at the intervention stage (B) changed (increased) when compared to the score acquisition at the first baseline condition stage (A1).

The increase in gross motor ability occurs in the ability to roll the ball, pass the ball and catch the ball. In the second baseline condition stage (A2) it was seen that the acquisition of the ball rolling ability score and the ability to catch the ball increased when compared to the score gain in the intervention condition (B). However, for the ability to pass the ball, the results of measurement and data collection showed that the score gain at the second baseline condition stage (A2) did not developmental outcomes.Research Ketcheson et al. (2017) concluded that their findings highlight the importance of including motor programming as part of the early intervention services provided to young children with an autism spectrum disorder.

The novelty of this study compared to several previous studies is that the subject is at the grade V level of an elementary school in Indonesia. Based on the analysis data, it was concluded that the effect of this study showed that manipulative exercise has an influence on the gross change (stable) when compared to the score gain at the intervention condition stage (B).This research is supported by several previous studies that can be used as a comparison, including Monteiro et al. (2022), Mohd Nordin et al. (2021), and Ketcheson et al. (2017).

Research Monteiro et al. (2022) gives the conclusion that considering the importance of physical activity clinically for children with ASD, a systematic review with this meta-analysis showed that physical activity did not have a statistically significant effect on coordination in individuals with ASD. Research Mohd Nordin et al. (2021) concluded that it is important to assess motor development in ASD children because there are significant motor delays in these children compared to developing children, and the delays become more pronounced with age. Early detection of motor delays can enable the provision of early intervention services to optimize motor ability of students with autism, so manipulative exercise can be used as an alternative in increasing gross motor ability. This success may be influenced by several other factors suchas social, cultural, linguistic, and possibly even genetic characteristics that can be used for further study.

Conclusion

The results showed that manipulative exercises have an influence on the gross motor ability of students with autism, so manipulative

exercises can be used as an alternative in increasing gross motor ability. This success may be influenced by several other factorsthat limit thisstudy suchas social, cultural, linguistic, and possibly even genetic characteristics that can be used for further study. The recommendation for further research is to conduct further research by paying attention to the limitations of this research.

Acknowledgment

The author would like to express his deepest gratitude to Ma'arif Nahdlatul Ulama Kebumen University, Yogyakarta State University, University of Beira Interior, and the University of East Sarajevo 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 has no involvement in any particular conflict of interest.

Ethics Statement

Penulisan Artikel Ini Telah Melalui Segala Prosedur raletika yang berkaitan dengan ranahakademis.

Authors Contribution

First author: problem formulation, methodology, data collection, data analysis, discussion, and article writing. **Second author**: methodology, data collection, data analysis, discussion, and article writing.**Third author**-methodology, data analysis, and discussion. **Fourth author**-methodology, data analysis, and discussion.

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

RESEARCH ARTICLE

Nordic Walking - The Effectiveness of a New Form of Exercise in Adults After COVID-19 Infection: A Randomized Controlled Trial

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Abstract
The purpose of present study was investigating the effectivenes of Nordic walking exercise (NWE) on physical activity level, physical fitness level**,** dyspnea, fatigue, functional status, depression and life quality after COVID-19 undergoing home isolation.Thirty subjects were randomly assigned in NWE (n=15) and control group (n=15). NWE group performed NWE 3 days a week for 6 weeks. The control group was not given any exercise. For physical fitness level, upper-lower extremity muscular endurance (arm curl test- chair sit and stand test)**,** lower aerobic (two minutes step test) and cardiopulmonary endurance (six minute walk test), flexibility (back scratch and sit and reach test)**,** balance (time up and go test) was assessed. The International Physical Activity Questionnaire Short Form (IPAQ-SF) was used to evaulate physical activity level. The anxiety-depression level was determined by Beck Depression Questionnaire. The dyspnea with Modified Medical Research Council (mMRC), functional status with Post-COVID-19 Functional Status Scale (PCFS), fatigue with Fatigue Severity Scale (FSS) and quality of life with Nottingham Health Profile (NHP) were determined. In NWE group, significant improvements were observed in upper-lower muscular extremity, lower aerobic, cardiopulmonary endurance, balance, mMRC, FSS, NHP energy, emotional reactions, sleep and total scores ($p<0.05$). Upper-lower muscular extremity, lower aerobic, cardiopulmonary endurance, balance, PCFS, IPAQ-SF walking and NHP energy scores were statistically different between groups in favor of NWE group ($p< 0.05$). NWE can be recommended physical activity program to improve physical health and functional status after COVID-19.

Keywords
Nordic Walking, COVID-19, Physical Fitness, Exercise, Functional Status

INTRODUCTION

The adverse effects of COVID-19 on cardiopulmonary, nervous and musculoskeletal system have been reported (Yıldırım et al., 2020; Ekim et al, 2020; Aytür et al., 2020). In addition to its systemic damage, it also causes psychological dysfunction and reduces quality of life (Taş and Çağlayan, 2021). It is emphasized that rehabilitation and treatment models after COVID-19 should be planned due to the concern of facing treatment of a new population of disabled patients (Başaran and Güzel, 2020; Akalın et al., 2020; Amatori et al., 2020; Yavuz and Anar, 2021; Micielska et al., 2021; Sallis et al., 2021).The studies recommend improving respiratory functions, reducing sedentary time, increasing physical activity level, improving quality of life and emotional well-

Received: 09 March.2023 ; **Accepted:** 19 May 2023; **Online Published:** 01 June 2023
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How to cite this article: Acar, M., Öztürk, D., Doğan, ND., Ada, İ. and Demirer, DN. (2023). Nordic Walking - The Effectiveness of a New Form of Exercise in Adults After COVID-19 Infection: A Randomized Controlled Trial. *Int J Disabil Sports Health Sci*;2023;6(2):181-192. https: //doi. org/ 10. 33 43 8/ ijdshs. 1262512.

being, and increasing independence in daily living activities after COVID-19 (Akalın et al., 2020; Amatori et al., 2020; Yavuz and Anar, 2021; Micielska et al., 2021; Sallis et al., 2021).

Exercise therapy is seen as a safe and cost-effective way of treatment to reduce COVID-19 symptoms and improve well-being (Arslan and Ercan, 2020; Tunç et al., 2020; Xu et al., 2020). Studies generally focus on pulmonary rehabilitation practices in hospitalized patients (Pinho et al., 2020; Rooney et al., 2020). On the other hand, it has been reported that people with moderate and low-intensity infection show symptoms in the 4th and 12th weeks after COVID-19, in similar proportions to those who are hospitalized (Jimeno-Almazán et al., 2021).Based on this information, a rehabilitation program should be applied during and after the infection process for people who have had COVID-19 with isolation at home (Jimeno-Almazán et al., 2021).

Nordic walking exercise (NWE) is a special form of physical activity similar to nordic skiing performed using poles (Cugusi et al., 2017). It has become a form of exercise that attracts people of all ages around the world. It is a simple and feasible form of physical activity that can be performed in any place and population. In this form of exercise, brisk walking is performed using specially designed poles. Unlike other physical activities, upper trunk and upper extremityparticipate more in the activity (Tschentscher et al., 2013).Because of these features, NWE is an example of a whole-body exercise that produces a higher energy expenditure (Cugusi et al., 2017). Studies show that NWE improves aerobic capacity, muscle strength, balance, and well-being (Micielska et al., 2021; Cugusi et al., 2017). Therefore, it is recommended as a primary and secondary prevention method in very different populations in the literature (Tschentscher et al., 2013).

To our knowledge, no studies were found that show the efficacy of NWE that is a new form of exercise in adults after COVID-19 in the literature. In addition, there was no study researching the effects of exercise program in the group undergoing home isolation. Therefore the purpose of present study was to examine the effectiveness of NWE on physical fitness, physical activity level, anxiety-depression, dyspnea, fatigue, functional status and life quality in adults after COVID-19 undergoing home isolation.

MATERIALS AND METHODS

Study Design and Subjects

The present study was planned as a prospective and single-blind, parallel-group, randomized controlled trialat the evidence II level and was conducted between September 2022 and January 2023. The Medical Ethics Committee approval was obtained (KA22/355) with clinical trials number UMIN000050232.
Sociodemographic and clinical information were recorded after acquring the verbal and written consent from subjects.

The subjects with COVID-19 symptoms such as fever, pain, cough, loss of sense of taste and smell while PCR tests are positive who had been diagnosed at least 3 months and at most of 10 months past after the diagnosis of COVID-19 and treated with home isolation, were aged between 22 and 50 years were carried out in this study. The exclusion criterias of study were being musculoskeletal, neuromuscular and cardiovascular diseases, cognitive problems; being hospitalized for COVID-19 treatment, having no symptoms while PCR positive, undergone surgery in last six months that may prevent exercise tests and training.

The study of Nemoto et al. was used while investigating the sample size according to the time up go test datas (Nemoto et al., 2021). As a result, it was found that a total of 30 patients, at least 15 in each group were required to calculate a large effect with 95% power and 5% error probability.

Randomization

The simple random sampling was performed in this study.The subjects were randomly assigned to either the the NWE group (n=15) or control group (n=15) as shown in CONSORT flow diagram (Figure 1) using randomization program (https://www.graphpad.com/quickcalcs/randomize1/) by a study member team who was not involved in the evaluation of subjects. Subsequently, outcome mesaurements were performed by two physiotherapists, followed by NWE that were administered by different three physiotherapists. Assessors for testing were blinded to the groups.Due to the nature of the study, participants could not be blinded.

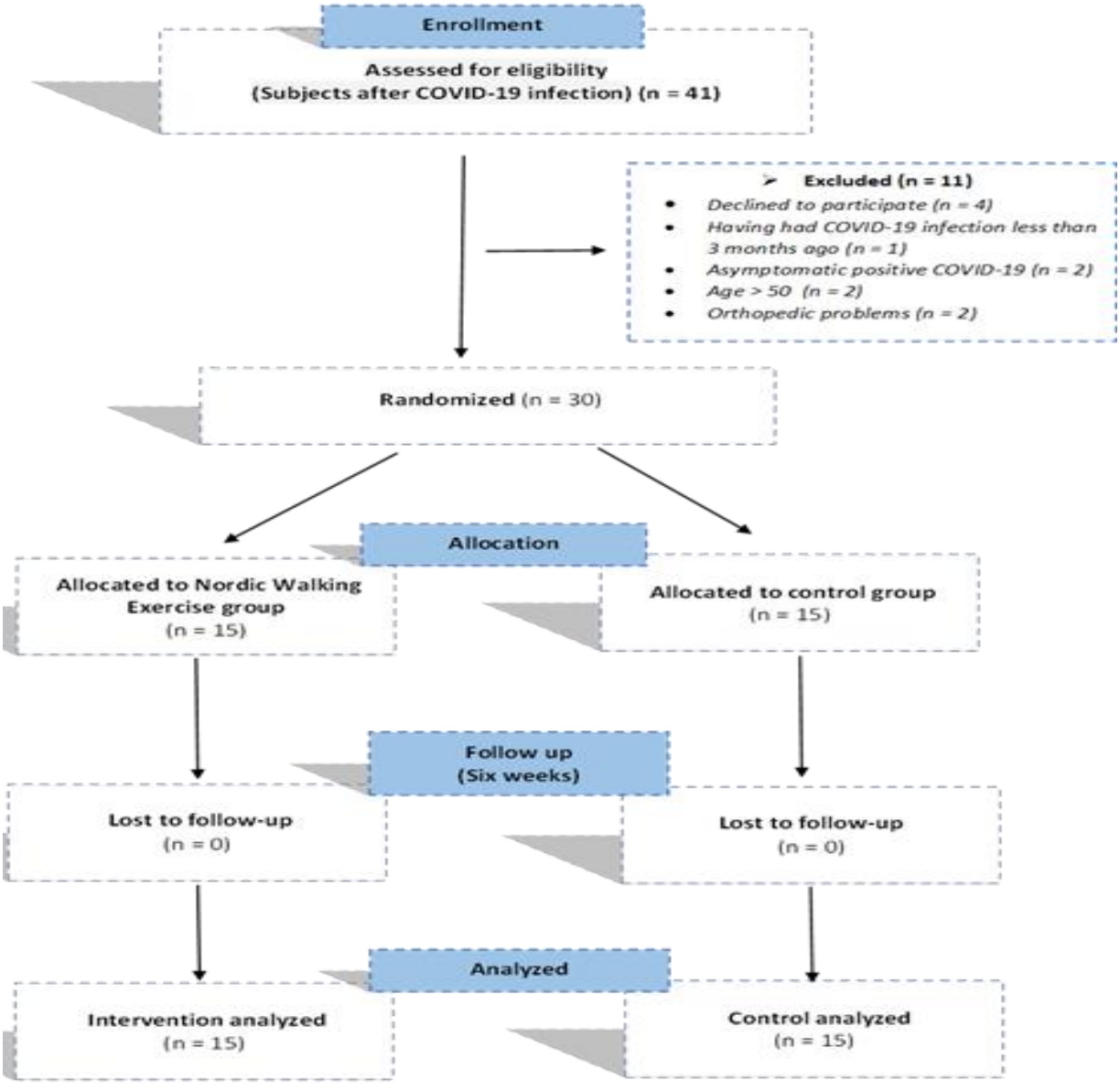

Figure 1. The flow diagram of study

Intervention

Subjects in NWE group were performed NWE three days a week for sixweeks after oneweek practice protocol under the supervision of a physiotherapist to control pulse, blood pressure and oxygen saturation. Subjects in control group did not performed any exercise program, only evaluations were made to them before and after research period.

NWE Protocol

The subjects walked outside using specially-designed poles which are attached to the hands via a strap, so propel themselves forwards with poles(Figure 2).

The practice protocol was applied threedays as 15 minutes onthefirstday, 15 minutes onthesecond day, and 20 minutes on the thirdday for oneweek. NWE was applied for sixweeks, increasing to 25 minutes in first week, 35 minutes in second week, and 45 minutes between third and sixth weeks at 60-80% of maximal heart rate and 4-6 scores according to Modified Borg Scale rated dyspnea or fatigue.

Before and after NWE, warming up and cooling down exercises including lower and upper extremity stretching, normal joint movement and breathing exercises were performed for 5 minutes each.

Figure 2. Nordic walking exercise

Outcome Measurements

PhysicalFitness Level

In order to evaluate the physical fitness levels, muscular and aerobic endurance, balance, flexibility and cardiopulmonary endurance were evaluated with following seven tests (Millor et al., 2017; Ducsky et al., 2011; Węgrzynowska-Teodorczyk et al., 2016; Miyamoto et al., 2018; Bassey, 1998; Steffen et al., 2002; ATS statement, 2002).

Chair sit and stand test was used to evaluate lower extremity muscular endurance. Subjects were asked to sit and stand up from a chair for 30 seconds. The number of repetitions made was noted (Millor et al., 2017).

Arm curl test was used to determine upper extremity muscular endurance. The bilateral number of elbow flexion and extension repetitions for 30 seconds was recorded (Ducsky et al., 2011).

Two-minute step test was used to assesslower extremityaerobic endurance. The midpoint of patella and iliac crestwas determined and line of this point was marked on the wall. Subject was asked to pull one knee and then other knee to reach this line for 2 minutes. The number of steps were recorded (Węgrzynowska-Teodorczyk et al., 2016).

Sit and reach test was used to measure lower extremity flexibility. Subject was instructed to reach forward with his torso with both hands without bending the knee. The distance between finger and toe tip was recorded in centimeters (Miyamoto et al., 2018).

Back scratch test was used to assess upper extremity flexibility. Hands were tried to be brought together on the back with one arm in external rotation and other arm in internal rotation. The distance between the longest fingers was recorded in centimeters (Bassey, 1998).

Timed up and go test was used to determine balance. Subjects were instructed to standing up from a chair, walking 3 meters, turning around and sitting in a chair andthe elapsed time was recorded (Steffen et al., 2002).

6-minute walk test (6MWT) wasperformed to examine cardiopulmonary endurance. Subjects were asked to walk as fast as possible at their own walking speed for six minutes on a 30-meter straight corridor. 6MWT distancewas recordedin meters(ATS statement, 2002).

Physical Activity Level

The physical activity levels were evaluated with the International Physical Activity Questionnaire Short Form (IPAQ-SF). The number of days people do activities, duration (minutes) and certain metabolic equivalentof task (MET)values of the activities are multiplied and the “MET-minute/week” unit score is obtained. It supplies time and energy consumption records for walking, moderate, vigorous and total physical activity level (Öztürk, 2005).

Anxiety-Depression Level

Anxiety and depression levels were determined by Beck Depression Scale (BDS) (Hisli, 1989; Beck et al., 1961).The total score changes from 0 to 63 points. As the total score increases, the severity of depression increases (Hisli, 1989).

Dyspnea

The dyspnea was determined by the Modified Medical Research Council Dyspnea Scale (mMRC). In the scale, the option “0” means “no dyspnea”, “1” option was “mild dyspnea”, “2” option was “moderate dyspnea”, “3” option was “severe dyspnea”, “4” option was “ very severe dyspnea” (Bestall et al., 1999).

Fatigue Severity

The fatigue severity was determined by the Fatigue Severity Scale. This scale consists of 9 items. The total score obtained when all scores obtained for each condition are added together and divided by nine was scale score. Those with score of 4 and above are considered tired (Armutlu et al; 2007).

Functional Status

The Post-COVID-19 Functional Status Scale was used to assess the functional status after COVID-19. The survey classifies functional status limitation as follows: death (grade 5) severe functional limitations (grade 4), moderate functional limitations (grade 3), slight functional limitations (grade 2), negligible functional limitations (grade 1) and no functional limitations (grade 0) (Çalik Kütükcü et al., 2021).

Quality of Life

Nottingham Health Profile (NHP) was used to evaluate quality of life. It consists of thirty eight items, six sub-dimensions (physical activity, sleep disturbance, social isolation, emotional reactions, pain and energy) and total scores. Each section is scored from 0 to 100. As the score increases, quality of life decreases (Kücükdeveci et al., 2000).

Statistical Analysis

The datas was analyzed by using the SPSS version 25. Confidence interval was accepted at 95%. Statistical significance level is accepted at $p<0.05$ value. Quantitative analysis was reported as median and change intervals (minimum-maximum). The frequency and percentage values are given for qualitative variables. The outcomes of homogeneity (Levene's test) and normality (Shapiro-Wilk) tests were used to determine that statistical methods should be used to make a comparison the research groups. Mann-Whitney U-test was used comparisons between groups and Wilcoxon test was applied comparisons between baseline and after training for each group for variables that did not meet parametric test assumptions. Chi-square test was performed to determine the distinction between categorical variables.

RESULTS

The follow-up of groups lasted for 6 weeks, and all of subjects were conducted in the analysis without any lost (Figure 1). The descriptive characteristics the groups were similar ($p > 0.05$) expect for gender ($p = 0.011$) (Table 1).

After 6 weeks of intervention there was a statistically significant improve in the chair sit to stand test ($p = 0.001$), bilateral arm curl test (right arm, $p = 0.006$; left arm, $p = 0.001$), two-minute step test ($p = 0.011$), time up-go test scores ($p = 0.001$) and 6MWT distance ($p = 0.001$) in the NWE group.It was not found significant difference in physical fitness parameters score between baseline and last measurement of the study in control group (Table 2).

When the NWE and control groups were compared at the after 6 weeks, chair sit to stand test ($p = 0.041$), bilateral arm curl test (right arm, $p = 0.018$; left arm, $p = 0.041$), two-minute step test ($p = 0.020$), time up-go test scores ($p < 0.001$) and 6MWT distance ($p < 0.001$)were statistically different between groups in favor of the NWE groupin Table 2. No statistically significant difference was observed in sit and reach test and bilateral back scratch test ($p > 0.05$) (Table 2).

There was no significant statistical differences were found between the NWE and control groups after 6 weeks for IPAQ total physical acitivity level ($p > 0.05$). The only significant improvement in physical activity levels was in the IPAQ walking score ($p = 0.018$) in the inter-group comparisons of values after 6 weeks in favor of the NWE group (Table 3).

It was found that dyspnea ($p = 0.014$) and fatigue severity ($p = 0.004$) statistically significant decreased after NWE. According to outcome measurement of baseline and after 6 weeks, while there were no significant between-group differences in anxiety-depression level, dyspnea, fatigue severity, there was a significant improvement in functional status ($p = 0.005$) (Table 3). There was a significant improvement in the emotional reactions ($p = 0.018$), energy ($p= 0.042$), sleep disturbance ($p = 0.012$) and total ($p = 0.036$) sub-dimensions of NHP in NWE group. It was found that only NHP energy score ($p = 0.002$) statistically significant different in the inter-group comparisons of values after 6 weeks in favor of the NWE group. There was no significant difference in sub-dimensions of NHP in the control group ($p > 0.05$) (Table 3).

Table 1. Descriptive characteristics of subjects

Variables	**NWE Group (n=15)** Median (min-max)	**Control Group (n=15)** Median (min-max)	**Z**	**p[a]**
Age (years)	24 (22-49)	24 (22-50)	-0.233	0.838
BMI (kg/m^2)	23.20 (20.00-31.25)	26.80 (17.24-35.19)	-1.162	0.250
Cigarette Consumption (packet*year)	0 (0-60)	0 (0-180)	-1.492	0.250
Duration of After COVID-19 (month)	6 (6-16)	8 (6-18)	-0.737	0.486
Gender	**n (%)**		**X^2**	**p[b]**
Female	12 (80)	10 (66.66)	6.533	**0.011**
Male	3 (20)	5 (33.33)		

p<0.05. [a] Mann Whitney U test. [b] Chi-Square test.min, Minumum; max, Maximum; BMI, Body Mass Index; NWE, Nordic Walking Exercise.

Table 2. The physical fitness scores between Nordic walking exercise and control groups.

Outcome Measurements	**NWE Group (n=15)**			**Control Group (n=15)**				
	Baseline Median (min-max)	**6 Weeks** Median (min-max)	**p[a]**	**Baseline** Median (min-max)	**6 Weeks** Median (min-max)	**p[a]**	**p[b]**	**p[c]**
Physical Fitness Parameters								
Chair sit and stand test (repetition)	14 (10-19)	18 (16-22)	**0.001**	13 (10-23)	17 (13-19)	0.167	1.000	**0.041**
Arm curl test (right) (repetition)	21 (12-27)	25 (20-30)	**0.006**	23 (11-38)	20 (13-30)	0.123	0.383	**0.018**
Arm curl (left) (repetition)	20 (10-28)	24 (20-30)	**0.001**	21 (11-26)	21 (13-30)	0.505	0.441	**0.041**
2-minutes step test (repetition)	92 (60-130)	106 (102-168)	**0.011**	101 (71-152)	97 (90-120)	0.460	0.191	**0.020**
Sit and reach test (cm)	1 (-20-12)	0 (-15-6)	0.101	5 (-14-13)	7 (-15-11)	0.550	0.228	0.088
Back scratch test (right) (cm)	0 (-9-7)	0 (-8-7)	0.408	0 (-8-9)	0 (-11-9)	0.490	0.387	0.387
Back scratch test (left) (cm)	0 (-10-4)	0 (-10-5)	0.172	-1 (-12-9)	-3 (-10-8)	0.256	0.310	0.424
Time up-go test (seconds)	6 (4-9)	4 (3.5-5)	**0.001**	6 (4-8)	5.6 (4.80-6.20)	0.051	0.900	**0.001**
6 minutes walking test distance (meter)	448 (230-600)	580 (520-710)	**0.001**	442.80 (200-650)	524 (470-570)	0.140	0.819	**0.001**

p<0.05. [a] Wilcoxon Test. [b,c] Mann Whitney U Test. min, Minumum; max, Maximum; NWE, Nordic Walking Exercise; p[a]: Baseline and after 6 week in each groups difference p values. p[b]: outcome measurement of baseline values p-values between groups. p[c]: outcome measurement of the end values p-values between groups

Table 3. The physical activity level, anxiety-depression, dyspnea, fatigue, functional statues and quality of life scores between Nordic walking exercise and control groups.

Outcome Measurements	NWE Group (n=15)			Control Group (n=15)				
	Baseline Median (min-max)	**6 Weeks** Median (min-max)	**p[a]**	**Baseline** Median (min-max)	**6 Weeks** Median (min-max)	**p[a]**	**p[b]**	**p[c]**
Physical activity level								
IPAQ walking score	630 (360-1260)	1039 (630-3150)	0.087	450 (150-4050)	660 (440-1702)	0.638	0.661	**0.013**
IPAQ moderate activities score	0 (0-1350)	120 (0-1260)	0.359	0 (0-2880)	0 (0-2160)	0.599	0.325	0.271
IPAQ vigorous activities score	0 (0-1440)	0 (0-1440)	0.285	0 (0-1440)	0 (0-1440)	0.344	0.229	0.386
IPAQ total score	1139 (360-2295)	1560 (695-3150)	0.112	1200 (405-4050)	1440 (600-10182)	0.182	0.646	0.967
Anxiety-depression level								
BDS score	4 (0-29)	5 (0-30)	0.968	2 (1-26)	5 (0-47)	0.125	0.883	0.631
Dyspnea								
mMRC score	1 (0-3)	0 (0-2)	**0.014**	1 (0-3)	1 (0-3)	0.157	0.808	0.380
Fatigue severity								
FSS score	4.20 (2.44-5)	3.30 (0-4.22)	**0.004**	3.77 (1.66-9)	3.77 (0-6.44)	0.184	0.868	0.245
Functional status								
PCFS score	0 (0-2)	0 (0-2)	0.102	0 (0-3)	2 (0-2)	0.297	0.346	**0.005**
Quality of life								
NHP pain	0 (0-47)	0 (0-26)	0.141	0 (0-83.78)	0 (0-89.50)	0.498	0.490	0.079
NHP energy	0 (0-100)	0 (0-24)	**0.042**	24 (0-100)	24 (0-100)	0.306	0.129	**0.002**
NHP emotional reactions	0 (0-31.51)	0 (0-9.36)	**0.018**	0 (0-76.25)	0 (0-100)	0.575	0.753	0.054
NHP sleep disturbance	16.10 (0-77.63)	0 (0-27)	**0.012**	43 (0-77.13)	0 (0-87.43)	0.114	0.320	0.107
NHP social isolation	0 (0-41)	0 (0-0)	0.180	0 (0-60.51)	0 (0-63.99)	0.465	0.162	0.073
NHP physical activity	0 (0-58.83)	0 (0-22.33)	0.068	10.79 (0-45.53)	0 (0-65.54)	0.138	0.839	0.153
NHP total	37.40 (0-184.48)	0 (0-63.89)	**0.036**	10 (0-92)	0 (0-85)	0.432	0.052	0.057

p<0.05.[a]Wilcoxon Test. [b,c.] Mann Whitney U Test.min, Minumum; max, Maximum; NWE, Nordic Walking Exercise; IPAQ, International Physical Activity Questionnaire; NHP, Nottingham Health Profile; mMRC, Modified Medical Research Council Dyspnea Scale; FSS, Fatigue Severity Scale; PCFS, BDS, Beck Depression Scale; Post-COVID Functional Status Scale; p[a]: Baseline and after 6 week in each groups difference p values. p[b]: outcome measurement of baseline values p-values between groups. p[c] : outcome measurement of the end values p-values between groups.

DISCUSSION

This study showed that compared to the non-exercise group, NWE resulted in benefits on physical activity, physical fitness, functional status, dyspnea, fatigue and life quality however, there was no impact in depression level.To the authors' knowledge, this is the first study to examine the efficacy of 6-week NWE on physical activity, physical fitness, anxiety-depression, dyspnea, fatigue, functional status and life quality in adults after COVID-19 undergoing home isolation.

Regarding the previous literature about positive effects of NWE, several studies showed that NWE increased physical fitness level and also had more improvement than the normal walking, because of the use of poles that involved a higher upper extremity muscles activations and more coordination movements (Ahmadi Hekmatikar et

al., 2022; Grigoletto et al., 2022; Cokorilo et al., 2022; Marciniak et al., 2020; Prince et al., 2019; Saulicz et al., 2015; Reed et al., 2022). We observed an improvement upper and lower extremity endurance, dinamic balance and cardiorespiratory endurance sub-parameters of health-related physical fitness after NWE. However, no improvement in flexibility was shown. The chair sit and stand, bilateral arm curl, two-minute step, time up-go test scores and 6MWT distance were shown to be superior to the control group at the end of our study. A significant increase in the distance covered during 6MWT and lower extremity endurance is not surprising, because it may be natural consequence of systematically practiced walking. Because arm activity is essential to walking with poles, an increase in upper extermity endurance manifested as an improvement in the arm curl test scores. While NWE, the use of the oxygen energy system and perform the movements that require coordination and balance, such as walking with buttons attach the hands may be the possible reason why it had greater effects on the development of aerobic fitness, muscular endurance, and balance than flexibility. As a result, although most studies in the literature were conducted with participants with cardiovascular disesases and elderly people, our results of physical fitness level are consistent with the other studies on the effects of NWE (Cugusi et al., 2017; Tschentscher et al., 2013; Nemoto et al., 2021).

As expected, while improvements in IPAQ walking parameter score after NWE were greater than in control group, no improvement was indicated in IPAQ moderate, vigorous activities and total score. Nemoto et al. evaluated the physical activity with accelerometry, found that maximal walking speed among the NWE group significantly improved compared with the simple walking group (Nemoto et al., 2021). Therefore, differences between methods evaluating physical activity may have affected this result.

Studies in the literature generally reported improvement in mood after NWE (Prince et al., 2019; Saulicz et al., 2015; Reed et al., 2022; Özdamar et al., 2022; Acar et al., 2022; Thaller et al., 2022). Prince et al. investigated that the effects of NWE on anxiety-depression level in heart failure patients and compared with standard exercise training. Anxiety-depression levels of heart failure patients decreased similarly in both groups (Prince et al., 2019). In our study, no improvement was observed in the depression score in NWE group either in post comparisons. We thought the reason for our results was that our subjects already had a low BDS score prior to training.

In our study, we showed a reduction in both fatigue and dyspnea level after NWE, although there was no statistically significant difference compared to control group.In the literature, very few studies have been found to determine the severity of fatigue and dyspnea after NWE (Santoyo-Medina et al., 2022; Breyer etl al., 2010). The study reported that similar fatique severity reduction both after NWE and conventionel aerobic exercise in multiple sclerosis patients (Santoyo-Medina et al., 2022). It was seen that a previous study reported exercise-induced dyspnea decreased after NWE compared to the control group in chronic obstructive pulmonary diseases patients (Breyer etl al., 2010). In addition, it is known that lower subjective fatigue, dyspnea and greater confidence occur during NWE when walking with poles (Tschentscheret al., 2013).

In a new review, showed that different training programs consist of aerobic and resistance exercises reduced activity-induced dyspnea and fatigue, increased muscle strength, functional independence and improved life quality in post-COVID-19 patients discharged from the hospital. The present study showed similar results with studies examining the effectiveness of different exercise training (Ahmadi Hekmatikar et al., 2022).Although there was no statistical improvement in functional status after NWE in our study, a significant improvement in favor of NWE was determined in the comparison of the NWE and control group.

Quality of life is an indicator of treatment success in biopsychosocial models refers to changes in physical, psychological, and social functioning (Haraldstad et al., 2019). In present study, positive improvement in energy, emotional reaction, sleep disturbance and total sub-scores of NHP were shown in NWE group. Besides, only energy sub-parameters of NHPstatistically superior to control group at the end of the study. NWE, which is an outdoor exercise form, has been shown to be effective on sleep quality and emotional state, as well as physical health. There are randomized controlled trials and reviews in many patient populations that have proven NWE

improves quality of life (Marciniak et al, 2020; Reed et al., 2022).

Although our study was conducted selfessly by experienced physiotherapists and our results consistent with the literature, we did'nt havelong-term follow-up that is a major limitation. Besides, we think that the effects of NWE can be compared with another aerobic exercise for example ordinary walking in future studies.

Conclusion

It was concluded that NWE enhances physical activity, physical fitness, dyspnea, fatigue, functional status and quality of life, however, there was no impact in depression level in people after COVID-19 in home isolation. The increase physical fitness and acitivity level, which is the most important determinant of chronic diseases with increasing incidence after COVID-19, shows that NWE can be a promising new form of physical activity in preventing future diseases.

Acknowledment

We gratefully thank everyone involved in this study, including the participants.

Author Contributions

Conceptualization, M,A.; methodology, M.A., D.Ö., D.D., K.D, İ.A.,; formal analysis, M.A., D.Ö., D.D., K.D, İ.A; investigation, M.A., D.Ö., D.D., K.D, İ.A; data curation, M.A; writing-original draft preparation, M,A.; writing—review and editing, M.A., D.Ö., D.D., K.D, İ.A; supervision, M,A.; project administration, M.A. All authors have read and agreed to the published version of the manuscript.

Declaration of Interest

The authors report there are no competing interests to declare.

Funding

This research received no external funding.

Ethics Statement

The study was conducted according to the guidelines of the Declaration of Helsinki. This study was approved by the Medical Ethics Committee of Baskent University (KA22/355). The registration of the study to clinical trials was done with the number UMIN000050232.

Informed Consent Statement

Informed consent was obtained from all participants involved in the study. Written informed consent has been obtained from the patients to publish this paper.

Data Availability Statement

The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy restrictions.

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

RESEARCH ARTICLE

The Effects of Emotional Intelligence-Oriented Psycho-Education Programme on Problem Solving and Decision-Making Skills

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Abstract
The study's goal is to find out how emotional intelligence training affects adolescents' capacity for problem-solving and making choices. With a pretest-posttest control group, this study is an actual experimental design. 22 students who were enrolled in secondary school using this paradigm participated in the study. Nonparametric tests like Mann Whitney U and Wilcoxon Signed Ranks were deemed appropriate for data analysis because there were fewer than 30 students in each of the experimental and control groups. Problem-solving and decision-making abilities were employed in the experimental and control groups of the conducted pretest findings, which are initially used for emotional intelligence. According to the study's findings, there was a significant difference in the students in the experimental group's total scores for emotional intelligence (Z = -2.402, p.05), problem solving (Z = -2.845, p.01), and decision-making skills (Z = -2.580, p.05). It has been discovered that emotional intelligence is useful in the improvement of decision-making abilities. The results of the study showed that there was a significant difference in the emotional quotient of the pupils in the experimental group (p.01). Additionally, a statistically significant difference in favor of the experimental group was discovered for both problem-solving and decision-making abilities (p .01). These results were talked about and understood.

Keywords
Emotional Intelligence, Problem- Solving, Decision-Making

INTRODUCTION

The concept of emotion has been the subject of many researches throughout history; accordingly, various definitions have been established (Frijda, 2000). In some of these studies, certain emotions are the result of psychological situations experienced by individuals in the face of events due to their own thoughts (White, 2010); emotions are a wide variety of experiences experienced as a reaction to internal or external stimuli (Datler, 2013); emotions are the forces that prepare and motivate the individual to take action (Frijda, 2000); psychological and biological states and a series of movement tendencies (Goleman, 2007) and the individual's response to relationships (Mayer, 2001) is defined as an emotional reaction.

Emotions are the basis for an individual to exhibit the necessary harmony for gaining life skills (Ekman & Davidson, 1994). These feelings are biological processes that develop suddenly and uncontrollably (Benson, at all, 2012). The beginning point of emotions is the nervous system, and based on this, it reveals the underlying brain mechanisms (Le Doux, 2006). The connections between the amygdala and the neocortex, which are part of the limbic system in the nervous system and have a primary role in the formation of emotional memory and reactions, are the main center of the mind, heart, emotion,

Received: 13 March.2023 ; **Accepted:** 26 May 2023; **Online Published:** 03 June 2023
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How to cite this article: Mert, A. (2023). The Effects of Emotional Intelligence-Oriented Psycho-Education Programme on Problem Solving and Decision-Making Skills. *Int J Disabil Sports Health Sci*;2023;6(2):193-203.https://doi.org/10.33438/ijdshs.1264456.

thought and behavior, so it can be said that emotions are present even in the background of superior decisions (Goleman, 2011). When the human brain receives any signs, it tends to react to fear, suspicion, astonishment, joy and relaxation (Le Doux, 2006). Although emotions are common to all people, their use may vary according to individuals (Petrides & Furnham, 2003). Emotions also occur differently in each person. At the same time, humans possess intelligence in the context of emotional thought.

Emotional intelligence first emerged as a product of multiple intelligence thinking. Gardner, the pioneer of multiple intelligence theory, has described intelligence as the ability to use problem-solving skills as a cultural product (Gardner & Hatch, 1990). "Mayer, DiPaolo, and Salovey (1990) were the first to use the term 'emotional intelligence' to describe the difference in individuals' emotional understanding and interpretation." Solving problems and making wise decisions using both thoughts and feelings or logic and intuition is part of emotional intelligence (Mayer & Salovey, 1997; Salovey & Mayer, 1990). Emotional intelligence is the ability to perceive and make sense of emotions, to regulate emotions (Mayer & Salovey, 1997), non-cognitive capacity and coping competence affecting external processes (Bar-On, 2005), self-control, self-motivation, determination and the ability to demonstrate patience (Goleman, 1995), to recognize and then differentiate oneself and others' emotions, and then use it as a guide (Salovey & Mayer, 1990). Emotional intelligence also involves recognizing and evaluating our own and others' emotions as well as information about emotions and emotions in our daily lives and work effectively to reflect the energy allowing us to respond appropriately (Yeşilyaprak, 2001). These reactions affect people's ability to solve problems. Skills are learned from childhood and developed during school years (Miller & Nunn, 2001). It is stated that individuals who solve problems effectively are independent and creative thinkers who are socially competent, confident and able to tolerate uncertainty (Dow & Mayer, 2004). Problem-solving contributes to an individual's knowledge, skills and behavior (Exley & Dennick, 2004). In problem solving, the individual re-organizes and uses previously acquired concepts and skills to solve problems encountered (Ünsal & Ergin, 2011). The ability to solve problems involves the use of cognitive abilities to make decisions and make the most appropriate decisions (Agran, et. al., 2002).

Some researchers argue that problem-solving and decision-making processes are similar and, therefore, that these concepts should be used together (Adair, 2000; Churney, 2001; Kushniruk, 2000). Today, the concept of problem solving is expressed as an element of cognition that is intertwined with terms such as thinking, decision making and judgment (Green & Gilhooly, 2012). Decision-making is the process of thinking through alternatives (Welton &Mallan, 1999). According to another view, the concepts of problem-solving and decision-making are different from each other (Elstein & Schwarz, 2002; Isen, 2001). Making decisions is generally defined as choosing among alternatives (Connor & Becker, 2003; Rollinson, 2002), and it is stated that if there is only one option to choose, decision-making cannot be utilized (Rollinson, 2002). In addition to being the most common type of problem we face in our daily and professional lives, decision making represents the basic processes for solving more complex and poorly structured problems (Means, et.al, 1993). In other words, decision making involves selecting one or more useful or satisfying options from a wider set of options. These options may include requirements, strategies, events, forecasts and opportunities. However, the decision always requires adherence to an action process that aims to give satisfactory results to an individual (Yates, 2003). Although there is extensive literature on decision analysis and decision-making processes, little attention has been paid to teaching students how to make effective decisions (Jonassen, 2012). In their study that was conducted for adolescents, Borders (2009) used a teaching technique to divulge the necessary decision-making skills for adolescents to reach constructive goals.

When the literature is examined, it is seen that there are studies examining the relationship between emotional awareness and expressing emotions and family education level and gender variables (Schilling, 1996; Harrod & Scheer, 2005). On the other hand, it was noted that the studies conducted on adolescents frequently cover the secondary education level. Considering that adolescence starts in the middle school years and the most intense stages occur during these years, there is a need for studies to be carried out in this stage. Developing these skills is considered to be

significant when it comes to the effectiveness of the decisions taken during adolescence and the problem-solving skills used throughout the life of the individual. This study aimed to investigate the effect of psycho-education programs on developing the emotional intelligence on problem solving and decision-making skills of secondary school students. For the following reasons, it is predicted that a significant improvement in the problem-solving and decision- making skills of participants will be observed.

There is no significant difference between the pretest scores of the experimental and control groups pertaining to the problem-solving and decision-making skills of secondary school students. There will be a significant improvement in the problem-solving and decision-making skills of the secondary school students who were administered the psycho-education program to improve emotional intelligence compared to the subjects in the control group, and this improvement will continue in the monitoring measurement of 45 days after the completion of the applications.

MATERIALS AND METHODS

Study Design

This experimental study aimed to determine the effect of psycho- education programs on the problem solving and decision-making skills of secondary school students. In the research, a real experimental design with a 2x3 factor mixed (split-plot) pretest and posttest control group defined as two-factor mixed design (Büyüköztürk, 2002/2007; Plano, Clark & Creswell, 2015) was employed. In this design, the first factor shows independent process groups (experiment, control), while the other factor includes pretest, posttest and monitoring measurements of the dependent variable.

This study was dapproved by Usak University Social Sciences and Humanities Scientific Research and Publication Ethics Committee (16/02/2023, Decision No: 2023-28-29-32) and written informed consent was obtained from the participants before starting the study.

Study Group

In this study, the sample age group was first specified by taking the need in the literature and the competence of the practitioner into consideration, so it was decided that the sample group should be secondary school students. The study was conducted with students studying at a secondary school in Usak during the 2017-2018 academic year. The Emotional Intelligence Scale (EIS), Problem Solving Scale (PSI) and Decision-Making Scale (DCS) were used to select the participants in the experimental and control groups. As a result of the counseling, interviews and scales administered by the school counselor, 11 secondary school students were included in the experimental group. 11 students were selected from the other middle school students in the same school via random selection forming a control group. The age range of the students in the research group varies between 12 and 13. Measurement tools were applied as part of the pretest before the application and as posttest at the end of the application. Monitoring scaling was performed 45 days after the completion of the applications.

Development of Psycho-education Program for Developing Emotional Intelligence

In this study, a 10-session psycho-training program was developed based on the literature and applied to 11 experimental groups (6 girls and 5 boys). No application was made to the control group. An interview was held with the school counselor who was planned to perform the practice and the subject that the students needed the most was determined as the subject of the psycho-education program, and as a result, the Taba-Tyler model was adopted and program development studies were carried out in eight stages. These stages include: a) identification of needs, b) identification of objectives, c) selection of content, d) arrangement of content, e) selection of learning experiences, f) regulation of learning activities, g) determination of what to evaluate and h) sequence of program elements and control of relationships (Oliva, 1988). While developing the program, Erkan's (2002) “Sample Group Guidance Activities" book, Reuven Bar-On's Emotional Intelligence Model (Bar-On), Köksal's (2007) thesis "Development of a program to develop emotional intelligence in wunderkinds" and the Ministry of National Education (MEB, 2007) Primary and Secondary Education Institutions Class Guidance Program Secondary Education Activities book were benefited from. Besides, before applying this program to the experimental group, the opinions of three experts with a doctoral qualification in the field of

psychological counseling were consulted and the program was prepared accordingly.

This program was implemented in the group counseling center of a secondary school in Uşak during the 2018-2019 academic year after obtaining the necessary permission from the school administration and parents. The psycho-education program was held on Tuesdays every week after the end of the school classes. A total of ten sessions took place, each session lasting approximately 45 minutes.

This program is designed to increase the emotional intelligence of middle school students in general. However, the steps that have been determined to help express emotions, improve their expressive skills and increase their psychological and personal well-being are as follows: a) having knowledge about emotions, b) expressing emotions in a concrete way, c) establishing emotion-sensory relationships, d) awareness of the relationship between emotion and bodily reaction, e) awareness of positive and negative emotions, f) ability to express their emotions using I language g) awareness of others' emotions, h) understanding of emotional intelligence levels and ı) solving personal problems by developing decision-making skills.

In these sessions, after meeting in a group, the students were asked what they knew about emotions. After each student shared their answer in turn, a common emotion definition was made based on information that the students shared and brief information was provided by the group leader. Emotion and emotional intelligence were defined. Between sessions, students were assigned homework "The Child that make Friends with his/her Feelings / Dr. Lauren Rubenstein" and their feelings or which page they were on were evaluated. Activities were conducted to improve the problem solving and decision making-skills of their emotional intelligence. A psychodrama game was conducted in order to enable students to confront their emotions after playing a role to improve problem-solving and decision- making skills.

In the last two sessions, a study of the effects of the program aimed at increasing emotional intelligence as well as applications to improve problem-solving and decision- making skills were conducted. In the last session, a "gossip" activity was held for the students to reflect upon the beginning and current changes. In addition, considering the age and developmental characteristics of the participants, role-playing and exercises were used to facilitated group communication.

Data Collecting Tools

Bar-On Emotional Intelligence Test Child and Adolescent Short Form

Within the frame of the research, "Bar-On Emotional Intelligence Test Child and Adolescent Short Form,", originally developed by Bar-On (2006) and adapted to Turkish by Karabulut (2012), was used to determine the emotional intelligence levels of the students. The scale consists of 25 items consisting of 4-point Linkert-type scale. The internal consistency coefficients of the scale adapted for the 4th and 5th grade students vary between .69 and .83 (Karabulut, 2012). In this research, the Cronbach alpha internal consistency coefficient of the whole scale was calculated to be .73.

Problem Solving Inventory

In the context of the research as a data collection tool, the original version was developed by Heppner and Petersen (1982) in order to measure students' perceptions of problem-solving skills. Its Turkish adaptation study conducted by Şahin, et.al. (1993) "Problem Solving Inventory" was used. The scale employed by Kardaş, Anagün and Yalçınoğlu was adapted for use with primary school students in 2014. The scale consists of a total of 35 items of Likert-type scored between 1 and 6. The results of the confirmatory factor analysis revealed that the Turkish version of the inventory, which was originally composed of three factors and 32 items, was composed of 20 items and the original inventory was composed of three sub-factors (Kardaş, et.al., 2014). The internal consistency coefficient of the adapted scale was found to be .83 (Şahin et al., 1993). In this study, the Cronbach alpha internal consistency coefficient of the whole scale was calculated to be .89.

Decision Making Scale in Adolescents

In the scope of the research as the third data collection tool, the original version was developed by Mann, et.al. (1989) for the purpose of determining the decision-making styles of adolescents in the 13 to 15 age group, and the adaptation study to Turkish was conducted by Çolakkadıoğlu and Güçray (2007) in which the "Adolescent Decision- Making Scale" was employed. The scale consists of 25 items consisting of 4 Likert-type items. The internal consistency coefficients of the adapted scale

ranged between .65 and .79 (Çolakkadıoğlu&Güçray, 2007). In this study, the Cronbach alpha internal consistency coefficient of the whole scale was calculated to be .80.

Analysis of the Data

The data were evaluated statistically using the SPSS (Statistical Package for the Social Sciences) 24.0 package program.Since there were 30 participants in this study, non-parametric tests were employed. It is important to understand the prerequisites for doing hypothesis testing and if the data meet them. Non-parametric tests applied to the data will produce more accurate findings if it cannot be determined whether the conditions are met (Kalaycı, 2010). Because the respondents were under 30, it was decided to carry out a nonparametric analysis. In experimental research when the normality assumption of score distributions cannot be Since the study sample consisted of a total of 22 students in the experimental and control groups, a normal distribution is not expected, so it was considered appropriate to use non-parametric tests for the present study. In the study, the meaningfulness level was accepted as .05 and .01.

RESULTS

The Mann-Whitney U test was used to determine whether there is a significant difference between the pretest total scores for emotional intelligence, and problem-solving and decision-making skills of middle school students in the experimental and control groups, and the data obtained are given in Table1.

Table 1. Mann-Whitney U test results related to scale total scores and pretest scores of experiments and control groups.

Scale	Groups	N	Rank Average	Rank Total	U	p
Emotional Intelligence	Experiment	11	9.18	101.00	35.00	.093
	Control	11	13.82	152.00		
Problem Solving	Experiment	11	13.45	148.00	39.00	.158
	Control	11	9.55	105.00		
Decision Making	Experiment	11	12.23	134.50	52.50	.597
	Control	11	10.77	118.50		

p>.05

As seen in Table 1, there was no significant difference between the total scores of emotional intelligences, problem-solving and decision-making skills of the students in the experimental and control groups. This finding shows that the students in the experimental and control groups are close to each other in terms of emotional intelligence, and problem- solving and decision-making skills.

The Wilcoxon signed-rank test was used to test the difference between the scores obtained from the pretest and posttest measurements of the total scores of emotional intelligence, problem-solving and decision-making skills of the students in the experimental group, and the results obtained are presented in Table 2.

Table 2: Wilcoxon signed-rank test analysis results related to scale total scores and pretest and posttest scores of the experiment group students.

Groups	Pretest-Posttest	N	RankAverages	RankTotal	Z	p
Emotional IntelligencePretest	NegativeRank	3	2	6.00		
EmotionalIntelligencePosttest	Positive Rank	8	7.5	60.00	-2.402	.016*
	Equal	0				
Problem SolvingPretest	NegativeRank	10	1.00	1.00		
Problem Solving Posttest	Positive Rank	1	6.50	65.00	-2.845	.004**
	Equal	0				
Decision MakingPretest	NegativeRank	10	4.00	4.00		
Decision MakingPosttest	Positive Rank	1	6.20	62.00	-2.580	.010*
	Equal	0				

**p<.01, *p<.05

As shown in Table 2, the total difference among emotional intelligence [Z = -2.402, p<.05], problem-solving [Z = -2.845, p <.01] and decision-making skills of students in the experimental group [Z = -2.580, p <. 05], was found to be significant. This finding shows that the posttest scores of the students in the experimental group differ significantly from their pretest scores. Based on this finding, it can be said that the 10-session psycho-education program aimed at increasing emotional intelligence had a positive effect on the students' emotional intelligence, and problem-solving and decision-makingskills. The Wilcoxon signed-rank test was used to test the difference between the scores obtained from the pretest and posttest in the total scores for emotional intelligence, problem-solving and decision-making skills of the students in the control group, and the results obtained are presented in Table 3.

Table 3: Wilcoxon signed rank test analysis results related to scale total scores and pretest-posttest scores of the students in the research group.

Groups	Pretest-Posttest	N	Rank Averages	Rank Total	Z	p
Emotional IntelligencePretest	Negative Rank	0	.00	.00	- 1.000	.317
Emotional IntelligencePosttest	Positive Rank	1	1.00	1,00		
	Equal	10				
Problem SolvingPretest	Negative Rank	5	6.40	32.00		
Problem Solving Posttest	Positive Rank	6	5.67	34.00	-.089	.929
	Equal	0				
Decision MakingPretest	Negative Rank	1	4.50	4.50	- 1.902	.057
Decision MakingPosttest	Positive Rank	7	4.50	31.50		
	Equal	3				

>.05

Table 3 shows the total scores for emotional intelligence [Z = -1.000, p> .05], problem-solving [Z = -.089, p> .05] and decision-making skills of students in the control group [Z = -1.902, p>. 05]. This finding shows that the pretest and posttest scores of the control group did not differ significantly. In the basis of this finding, it can be said that time and other environmental factors have no effect on emotional intelligence problem-solving and decision-making skills of the students in the control group. The Mann-Whitney U test was used to determine whether there is a significant difference between the total scores for emotional intelligence, and problem-solving and decision-making skills of middle school students in the experimental and control groups and the data acquired are presented in Table 4.

Table 4: Mann-Whitney U test results related to scale total scores and post test scores of experiments and control groups.

Scale	Groups	N	RankAverage	RankTotal	U	p
Emotional Intelligence	Experiment	11	16.23	178.50	8.50	.001**
	Control	11	6.77	74.50		
Problem Solving	Experiment	11	14.41	158.00	28.5	.035*
	Control	11	8.59	94.00		
Decision Making	Experiment	11	15.09	166.00	21.0	.009**
	Control	11	7.91	87.00		

**p<.01, *p<.05

As seen in Table 4, the difference in the total scores of emotional intelligences, problem- solving and decision-making skills of the students in the experimental and control groups was found to be significant. This finding shows that the posttest scores of the students in the experimental group differ significantly from the students in the control group. From this point of view for the finding, it can be said that the 10-session psycho-education.

DISCUSSION

During the course of this study, the effect of the psycho-education program on the problem-solving and decision-making skills of the secondary school students in the development of emotional intelligence was examined. In addition, it was observed that the posttest scores of the students in the experimental group differed significantly from their pretest scores, but no significant difference was found between the pretest and posttest scores of the control group students. While this finding shows that the students in the experimental and control groups were initially close to each other in terms of emotional intelligence, problem-solving and decision-making skills, the posttest results after the application of the emotional intelligence development-oriented psycho-education program to the students in the experimental group were compared. It was found to be effective in the development of applying skills. The results of the study support the findings of the study on emotional intelligence education conducted with 52 ninth-grade students (Tufan, 2011). Similarly, another study conducted with 68 university students support the results of the present study (Shao, et al., 2013). The findings of the study conducted by Di Fabio and Kenny (2012), which examined the relationship between emotional intelligence skills and decision-making styles, are in parallel with the present study.

Emotional intelligence as a type of intelligence (Gardner, 1993; Sternberg, 1988) is the body's responses to a specific stimulus, and the ability to regulate these responses can be increased by variation according to the individual (Gross, 1998; Gross & Thompson, 2007). The individual's emotional skills emerge from birth and develop rapidly in early childhood (Denham, et.al., 2003). While basic emotions such as happiness, sadness and anger are seen from infancy, it is seen that more complex emotions, such as guilt and regret, emerge in later ages (Çelik, et.al., 2002). This emotional development involves the child’s ability to recognize his or her emotions, to regulate and control his or her emotions and to establish emotion by transferring them to different situations (Bar-On, 2006). Therefore, besides the biological basis of emotional intelligence, it can be said that it is also effective in terms of social development (Denham, 1998). Sociobiologists argue that emotions adapt to life by asserting that feelings of anger protect us from the aggression of others, that pleasure and happiness drive individuals to approach each other and continue their species and that the crying behavior of the individual in sorrow and grief seeks assistance from others (Cüceloğlu, 1991). Similarly, Ekman (1992) stated that emotions are a source of motivation for quality of life and that it helps the individual to adapt to nature and society by increasing their probability of survival.

Emotions also have a significant role in terms of determining the direction of human behavior towards objects, ideas and others, protecting the values of the individual in certain situations and coping with the obstacles encountered by the individual (Schilling, 1996).

When emotions increase in a situation that is important for the individual or as a result of changes in their relations with others (Lazarus, 1994), it can be said that they carry meaningful messages for communication and interaction (Schwarz & Clore, 1983).

Goleman stated that individuals with a high level of emotional intelligence do not resist obstacles, control their impulses and are full of hope and empathy (Stubbs & Wolff, 2008). Schilling (1996) said that these individuals were able to take in, process and evaluate information in nature and turn them into emotional behavior. Similarly, Yeşilyaprak (2001) stated that individuals can use emotional intelligence in order to recognize and evaluate their own and others' emotions and reflect their knowledge and energy effectively in daily life and describe people who use their emotions effectively to achieve their goals. The concept of emotional intelligence, which has become increasingly common from the past to the present, has shown that people are not a biological machine (Suliman & Al-Shaikh, 2007), and as a result employers have directed their employees to various emotional intelligence development courses (Wong & Law, 2002). The emotional skills of children who grew up without communicating with people face-to-face in front of the television and computer did not improve, and this result increased the need for educational programs to strengthen their emotional intelligence (Yaşarsoy, 2006).

Because emotions emerge and are developed at an early age, it is thought that emotional awareness and empathy training starting from the

pre-school period and on will be effective in structuring individuals with drama according to the developmental period. The learning environment and the role of the teacher are of great importance in the acquisition of these skills. For this reason, teachers should possess enough information about emotional intelligence and be able to organize an environment that is conducive to improvement. It is thought that conducting in-service training or teaching emotional literacy courses as elective courses in the faculty of education will be effective for improving awareness of emotional intelligence among teachers. In addition, it is thought that this training will be provided by school psychological counselors as a consultation service to other teachers and families within the scope of preventive and developmental guidance to students and will contribute to the development of students at the cognitive and social levels.

A high level of emotional intelligence, which is effective for decision-making and problem-solving, encourages students to communicate more effectively and will contribute to the development of positive learning environments. It is believed that various studies and training programs will contribute to the field.

Conclusion

For raising the effectiveness of psycho-education programs, which are directed towards the development of emotional intelligence, administering this program to students of different ages and levels of education may be suggested. While preparing the psycho- education program, activities based on humanitarian theory were used. In a new group study, different approaches such as behavioral theory and cognitive theory may be preferred. In addition, a monitoring test was performed 45 days following the psycho-education application. Multiple monitoring tests can be performed at different intervals to test the effectiveness of the study. In addition to the psycho-education program to develop emotional intelligence to increase problem-solving and decision-making skills, individual sessions can also be held with the participants. Finally, experts working in the field of psychological counseling can adapt this program to the needs of their students and institutions. Furthermore, studies can be conducted with larger groups in order to increase the problem-solving and decision-making skills of the students in educational institutions at the secondary level.

Conflict of Interests Statement

There are no conflicts of interest for the contributing author.

Funding

The research, writing, and/or publication of this paper were all done without any financial assistance from the author.

Ethics Statement

The study protocol was approved by Usak University Social Sciences and Humanities Scientific Research and Publication Ethics Committee (16/02/2023, Decision No: 2023-28-29-32) and written informed consent was obtained from the participants before starting the study.

Author Contributions

Planned by the author: Study Design, Data Collection, Statistical Analysis, Data Interpretation, Manuscript Preparation, Literature Search. Author 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

An Investigation of Teachers' Views on the Difficulties at School of Secondary School Students with Attention Deficit Hyperactivity Disorder

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Abstract
This research aims to investigate the views of teachers on educational, emotional, and social difficulties experienced by secondary school students with attention deficit hyperactivity disorder (ADHD), in addition to revealing the opinions of secondary school teachers on the elimination of these problems. This study has a qualitative research design, the chosen participants consisted of the teachers of Akdoğan Polatpaşa Secondary School, and the data was gathered via semi-structured interview questions. The obtained data were analyzed by content analysis method as well as the use of NVivo qualitative data analysis computer software. The research findings identified the views of secondary school teachers about the type of educational, behavioral, emotional, and social difficulties encountered by students with ADHD and the findings depicted the opinions of the teachers about the solution suggestions regarding these difficulties. As a result, the viewpoints of the secondary school teachers at hand provide insights about the diagnosis of ADHD in the context of educational, behavioral, emotional, and social problems of their secondary school students. In general, they were revealed as not being able to focus, having impulsive activity, having difficulties in academic life, difficulties in communication, exposure to bullying, displaying aggressive behaviors, feeling lonely, and having the feeling of worthlessness. In addition to the above, the teachers clearly expressed opinions regarding the solution to these problems, and these are explained in the paper.

Keywords
ADHD, Educational Problems, Emotional Problems, Social Problems

INTRODUCTION

The cycle we spend on Earth has certain periods of life for individuals. These periods include infancy, pre-school period, school period, adolescence, adulthood, and old age. Each period has its developmental characteristics. Individuals can exhibit the same characteristics in the same period (Agha & ELDaou, 2018). The name of this in the literature is defined as normal development (Baykoç-Dönmez, 2017). As in every period, there may be children with similar developmental characteristics in adolescence, as well as children with different emotional, physical, or learning needs. In the context of meeting these needs, individualized or customized education programs have been put on the agenda (Ministry of National Education [MEB], 2011).

There are different definitions in the literature for individuals who show differences in terms of developmental characteristics. These can be stated as "children with different development", "children with special needs", "children with learning differences", "children

Received: 14 March.2023 ; **Accepted:** 01 June 2023; **Online Published:** 05 June 2023
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How to cite this article: Kağansoy Kocaismail, HH. and Sorakin, Y. (2023). An Investigation of Teachers' Views on the Difficulties at School of Secondary School Students with Attention Deficit Hyperactivity Disorder. *Int J Disabil Sports Health Sci*;2023;6(2):204-217.https://doi.org/10.33438/ijdshs.1264878

with developmental differences", and "individuals with special needs" (Baykoç-Dönmez, 2017, p. .20). In addition to diagnoses such as autism spectrum disorder, intellectual disability, and special learning disability, individuals with “Attention Deficit and Hyperactivity Disorder (ADHD)” are also included in the scope of individuals with special needs (Baykoç-Dönmez, 2017). It is suggested that the prevalence of ADHD in the world population is between 3.4-5.3% in childhood and adolescence and 2.8% in adulthood (Polanczyk et al., 2007). In studies on the prevalence of ADHD in Turkey, this rate was determined as 13.38% (Ercan et al., 2016).

Considered a psychiatric disorder, ADHD can negatively affect an individual's life in at least one area and includes excessive activity and impulsivity (Gözeten, 2019) and has been described as a disorder in which attention is easily distracted. Another definition has been defined as excessive activity and impulsivity that is not suitable for the developmental characteristics required by the age of the individual, due to the insufficient functioning of the attention and movement centers of the mind (Gümüş, 2015). Although ADHD diagnosis is seen at a rate of 5-7% in society, neurobiological (Motavalli-Mukaddes, 2015) and developmental disorders (MEB, 2017) have been described as. It arises as a result of heredity and interaction (Ercan, 2008).

Although the exact cause of ADHD is not known, there are various studies on the existence of conditions that may cause this diagnosis. (Barkley, 2005; Gözeten, 2019). Both genetic (80-90%) and environmental factors affect the development of ADHD (Ercan, 2008). Individuals diagnosed with ADHD experience difficulties in various areas such as home, school, and work life. Due to the specified diagnosis, the individual may have difficulties in establishing relationships with their peers, in school success, and their relationship with their parents. (Default, 2010; Herman et al., 2007; Johnston & Mash, 2001; Mrug et al., 2009; Seipp & Jonhston, 2005; Ilik, 2019; Berestova et al., 2022). Some psychiatric and behavioral diagnoses may accompany ADHD diagnosis, such as reading disorder, behavioral disorder, anxiety disorder, depression, and learning disability (Reale et al., 2017; Yoshimasu et al., 2012).

The first step in correctly responding to every difficulty individual experiences is to get a correct diagnosis of what the difficulty is. The same goes for the diagnosis of ADHD (Selikowitz, 2009). ADHD can cause excessive movement in the individual, irregularity in emotional development, and some difficulties in learning. Moreover, it can negatively affect mood and hurt self-confidence (Yazgan, 2011). Individuals diagnosed with ADHD may experience some difficulties. These are attention, social learning (Özdoğan et al., 2005), Ability to use some strategies and manage the problem situation while solving problems (Barkley, 2005). At this point, early diagnosis and, accordingly, early treatment can contribute to positive results regarding these difficulties in the life of the individual diagnosed with ADHD (Parker, 2006). Early diagnosis enables the individual diagnosed with ADHD to learn to cope with it before symptomatic behaviors become permanent (Peacock, 2002). It is known that drug treatments are generally used in the treatment of ADHD. In some individuals, it may be preferable to use psychoeducational approaches instead, where drug treatment can be delayed or not needed (Yazgan, 2011).

It is known that drug therapy and psychoeducational therapy are substitution treatment methods for ADHD treatment. It can be said that treatments using both methods give better results. In the treatment of ADHD, it is inevitable to provide information and counseling to patients and their relatives. Under the umbrella of psychosocial treatment, information, parent education, school arrangements, social skills training, cognitive behavior therapy, group therapy, and behavior modification methods are discussed (Gümüş, 2015; Sobhani et al., 2018; Kelemen, 2018). While there is no cure for ADHD symptoms, there are treatments that can reduce symptoms (Luo et al., 2019). Psychiatrists generally prefer drug therapy. However, drug treatments alone have not achieved sufficient success in reducing problem behaviors (Evans et al., 2008). It has been concluded that combining psychotherapy, behavioral therapy and psycho-educational support with drug therapy will yield more positive results when treating ADHD (Gill & Bhatt, 2016; Elsayed & Salama, 2020; Hafeez, 2022).

Attention and social problem-solving of individuals diagnosed with ADHD (Özdoğan et al., 2005) and the development of metacognitive skills, which are prerequisites for learning (MEB, 2017; Andegiorgis, 2020) are known to have problems. In this study, the opinions of teachers

working in secondary education institutions about the educational, behavioral, emotional, and social problems of secondary school students diagnosed with ADHD and the solution suggestions of secondary school teachers were investigated.

The problem sentence of this research is "What are the opinions of teachers and solution suggestions regarding the problems experienced by secondary school students with ADHD at school?" determined as.

Purpose of the study

The purpose of this research is to reveal the opinions and suggestions of teachers about the behavioral, educational, emotional, and social difficulties experienced by students who are diagnosed with Hyperactivity and Attention Deficit and continue their secondary education. to identify and offer suggestions for solving these problems. In addition, it is thought that it will shed light on the experts researching this issue. Accordingly, the sub-objectives are as follows:

1. What are the teachers' views on the educational problems experienced by secondary school students with Attention Deficit and Hyperactivity Disorder?
2. What are the teachers' views on the emotional problems experienced by secondary school students with Attention Deficit and Hyperactivity Disorder at school?
3. What are the teachers' views on the social problems experienced by secondary school students with Attention Deficit and Hyperactivity Disorder?
4. What are the teachers' suggestions regarding the solution to the problems experienced by secondary school students with Attention Deficit and Hyperactivity Disorder at school?

Importance of the Study

Individuals diagnosed with ADHD are among the frequently encountered problems in schools, that is, in the educational areas of life, as in the whole of society. Especially in recent years, ADHD has emerged as a diagnosis that is among the referrals made to psychological counseling and guidance services in schools. Attention deficit hyperactivity disorder is among the findings that the prevalence of ADHD in the world and Turkey varies from very low rates such as 0.02%-0.04% in school-age children to high rates such as 23.4%-27.0% (Biederman, 2005). To diagnose ADHD, it is very important to observe the child in the clinical environment and to obtain realistic information about the ADHD symptoms in the child from people who know the child closely, such as parents and teachers (Alkan et al.2020). ADHD needs to be treated at the appropriate time and in the right way, both for himself and his family and environment. For this reason, the importance of the role of nurses, teachers, and especially families comes to the fore, as the knowledge about ADHD and the approaches to the disease are effective in the early diagnosis process. Teacher awareness, which is needed in the identification process, is of great importance for these reasons. The first step in correctly responding to every difficulty individual experiences is to get a correct diagnosis of what the difficulty is. The same goes for the diagnosis of ADHD; correct diagnosis (Selikowitz, 2009).

In this study, the problems experienced by secondary school students with attention deficit and hyperactivity disorder at school were investigated. The awareness and knowledge of secondary school teachers about these problems contribute to the identification process. Understanding the problems experienced by secondary school students with attention deficit and hyperactivity disorder will enable solutions to these problems. It is thought that it will guide teachers who work or want to work with secondary school students with attention deficit and hyperactivity disorder, the awareness of teachers on this issue will increase, and this awareness will reflect on the quality of education. For all these reasons, this research gains importance.

MATERIALS AND METHODS

Model of the Research

In this study, the qualitative research method, which is one of the most used methods in social research, was used. In qualitative research, methods such as observation, interview, and document analysis are used as data collection methods. Qualitative research methods are a method applied to the existence and presentation of events in their natural environments realistically and holistically (Yıldırım, 2005). In the process of collecting data, researchers using methods such as observation, interview, and document analysis are called qualitative research. Qualitative research is a method in which the data are presented realistically and holistically in the natural environment and the non-numerical,

qualitative process is followed (Yıldırım & Şimşek, 2013).

This research is classified as a phenomenological study in that it deals with the opinions of teachers about students who have ADHD and, in this context, who have educational, behavioral, social, and emotional problems at school, and their suggestions for the solution of problems. Studies in which opinions and suggestions about any concept are discussed are defined as phenomenological studies (Creswell, 2014).

Statement of Compliance with Ethical Principles

I have obtained the data, information and documents I have presented in this thesis within the framework of academic and ethical rules; I present all information, documents, evaluations and results in accordance with scientific ethics and morals; I declare that I have made full reference to all data, thoughts, results and information that do not belong to me in this study, in accordance with scientific ethical rules, and that I have cited the source.

Participants

The sample in this study is the teachers who teach secondary school students with ADHD in the TRNC. The study group consists of 35 teachers working at Akdoğan Polatpaşa High School in the 2022 academic year and giving education to secondary school students diagnosed with ADHD. To determine the participants in this study, the criterion sampling method, which is one of the purposeful sampling types used in qualitative studies, was used. Purposeful sampling is the selection of information-rich situations to conduct detailed and in-depth research about the phenomenon that is the subject of qualitative research (Büyüköztürk, 2014). The criterion sampling method, on the other hand, means that the researcher who does the research chooses the individuals to work with (Crewsell, 2013).

These individuals are individuals who can voluntarily share information, opinions, and suggestions. The purpose of using the criterion sampling method is that the researcher selected the participants according to certain criteria. There are some predetermined criteria under the umbrella of this study. In terms of the richness of the data obtained from the sample, teachers who have worked or are currently working with students diagnosed with ADHD have been selected regardless of their field and seniority. In other words, the teachers in the study group are those who have the opportunity and experience to observe students with ADHD in the classroom and school environment. Among these teachers, some teachers have both worked with students diagnosed with ADHD in the past and who are currently working.

Data Collection Tools

Semi-structured visualization technique was used as a data collection tool. With this technique, both fixed answers are obtained and in-depth analysis can be made. In this method, while deepening on the subject, which is deemed necessary, is classified as an advantage; shifting to unimportant areas was also considered a disadvantage (Büyüköztürk et al., 2018)

In the semi-structured interview technique, the researcher makes a preliminary preparation with the questions. Questions are planned. Moreover, he may ask different sub-questions to clarify the answer given according to the course of the interview. Or, he may not ask the question he received in another question, this method is a method that can be used in educational research due to its standards and flexibility (Türnüklü, 2000). To ask the questions be the subject of the research, a literature review was conducted before the interview questions were prepared. Both the data obtained from the literature and the experts working in the field of ADHD were exchanged, and then interview questions were prepared. Interview questions consist of 9 questions in total. Among these questions, there are also questions prepared to reach the demographic information of the interviewees.

All necessary documents were collected and legal permissions were obtained to carry out the research. An application was made to Near East University for the ethics committee. Afterward, permission was obtained from the Polatpaşa High School principal to be able to interview the secondary school teachers selected for the study group. The teachers were called by phone and the day and time were determined for the interview. The time set for the interview is 30 to 40 minutes. varies between Before starting the interviews, the participants were informed about the study. The interviews were generally held in the guidance service's environment, between the interviewer and the researcher. During the interview, the teachers were asked again the interview questions that they had planned and answered via Google forms.

Analysis and Interpretation of Data

To analyze the findings obtained in the research, the answers given by the speakers in the study group to the research questions were analyzed using the content analysis method. The reason for this is that the previously undetermined themes are determined by using the content in line with the answers given by the participants (Büyüköztürk et al., 2014). He made the definition of content analysis as follows: "Content analysis is carried out to determine the presence of certain words or concepts in a text or a set of texts. The existence, meanings, and relations between these words and concepts are determined and inferences are made about the message in the text as a result of the analysis. During the analysis of qualitative data, the language and words used by the speakers are of great importance. The reason for this is that the findings will be reached with words. In the data analysis and coding process, the researcher may feel the need to make some adjustments so that the analysis can be done most accurately (Bloomberg & Volpe, 2012). Coding studies were carried out with care and expert help was received. In this process, first of all, categories were developed, keywords were determined for each category, the data obtained were coded, and quotations were carefully selected so that the people who directed the research and examined the study could better understand it. Finally, the data is divided according to themes and codes. In each section, quotations from like-minded participants that fit the theme of that section are included. After the findings, the discussion, conclusion, and recommendations sections are included.

Validity and Reliability

It is known that validity and reliability studies are important in both qualitative and quantitative research. However, it is not possible to talk about reliability and validity in a way that would be perfect in qualitative research (Neuman, 2007). Reaching the same result every time in a measurement means that it is reliable. However, not all reliable results may be valid. That is, the reliability required for validity alone does not guarantee the validity of the measurement.

In this study, to increase its reliability, the researcher evaluated the themes he found each time with his advisor and ensured consistency. In addition, the same questions were directed to the teachers in both Google forms and face-to-face interviews, and the consistency of the answers was tried to be ensured.

In qualitative studies, the objective observation of the researched subject or phenomenon by the researcher explains the concept of validity (Patton, 2002). To contribute to the validity; Methods such as peer evaluation, obtaining information from colleagues, and external audit are among the methods used in qualitative research (Creswell, 2013). To ensure the validity of the data obtained in this research; Another psychological counselor working in the field was informed and his evaluation was sought. In addition, before the face-to-face interview, semi-structured interview questions were asked to the teachers via Google forms. Moreover, care was taken to be compatible with the literature and to be connected with the sub-objectives of the research.

RESULTS

In this section, findings and interpretations based on these findings are given. According to the findings obtained from the teachers participating in the study, the educational problems experienced by secondary school students with ADHD at school are shown numerically in Table 1.

While the teachers were expressing the educational problems experienced by secondary school students diagnosed with ADHD, they mostly expressed sentences about not being able to focus and having difficulties in the academic process. The expressions of being distracted by those around, being constantly on the move, and having difficulty maintaining their attention are among the opinions expressed by the teachers.

Some of the answers given by the participants are as follows;

Problems of adaptation, inability to focus on the lesson, difficulty in fulfilling the given tasks, and inability to stay silent in situations where it is necessary to remain silent... (T2).

Problems in focusing, inability to concentrate and maintain attention, not being able to follow the lesson, being behind while keeping the lecture notes, and excessive activity that negatively affects the classroom order...(T19).

Table 1. Opinions of the participants on the educational problems experienced by students with ADHD

Specified student characteristics	Number of of Teachers (n)
Inability to focus	25
Having Difficulty Following the Academic Process	16
Experiencing Learning Disabilities	5
Distracting Others	5
Being on the Move	5
Having Difficulty Maintaining Expected Attention	5
Difficulty Adapting to Classroom Order	4
Adverse Impact When Environmental Factors Are Not Regulated	3
Self-Perception Due to the Difference Experienced in Learning	2
The feeling of Inadequacy	2
Difficulty Remembering	2
Difficulty Performing	2
Difficulty in Group Work	2
Influence of Teacher's Attitude on Learning Process	2
Having Difficulty Learning a Foreign Language	1
Difficulty Keeping Quiet	1
Difficulty Socializing	1
Negatively Influencing Peers' Learning Process	1

T4, T8, and T22 coded teachers from the participants used the following statements to express that they had difficulty in fulfilling the ADHD diagnosis as they were distracted;

Difficulties they experience in adapting to the training, not being able to keep up with the pace of the curriculum (T4), their focusing time being too short (T8), and falling behind compared to their classmates (T22).

According to the findings obtained from the teachers participating in the study, the emotional problems experienced by secondary school students with ADHD at school are shown numerically in Table 2. In addition, the findings obtained from the NVIVO program are shown in fig 1.

Figure 1. *NVIVO program results*

Table 2. Opinions of the participants on the emotional problems experienced by students with ADHD

Specified student characteristics	Number of Teachers (n)
Feeling Lonely and Worthless	27
Inability to Control His Anger	9
Lack of Self-Confidence in Academic Field	7
Exposure to Bullying	5
Behavioral and Emotional Imbalance- Instability	5
Difficulty Expressing Themselves	4
Being Sensitive and Sensitive	4
They Don't Have Social and Emotional Problems	2
Worry about Falling Back	1
Future Anxiety	1
Inability to Solve Problems	1

Teachers, while expressing the emotional problems experienced by secondary school students diagnosed with ADHD, gave place to statements about feeling lonely and worthless the most. Two teachers who participated in the study stated that they did not experience any emotional problems. Some of the answers given by the participants are as follows;

I don't think they have emotional problems other than their lecture notes, they have a good relationship with their peers, and they are very social and in communication with their peer groups…T20. These students think that they are not understood and they become unhappy. They may have trouble expressing their feelings and thoughts. Emotions can change very quickly. Sometimes they can be very emotional and sometimes irritable T8.

According to the findings obtained from the teachers participating in the study, the social problems experienced by secondary school students with ADHD at school are shown numerically in Table 3.

Table 3. Opinions of the participants on the social problems experienced by students with ADHD

Specified student characteristics	Number of Teachers (n)
Having Problems with Socializing and Communication	29
Having Problems with Acceptance-Exclusion	13
Exposure to Bullying	4
Experiencing Expression Difficulties	2
Low Confidence	2
Not Understanding the Problems They Experience Most	1
Staying behind the Class	1
I Don't Think They Have Social Problems	1
Imbalanced Behavior to Get Attention	1
They Prevent Their Friends From Listening To The Class	1

Teachers, while expressing the social problems of secondary school students diagnosed with ADHD, emphasized that they mostly experience problems in socialization and communication and that they have problems in being accepted and excluded. The sentences containing a few statements from the participants, which imply that students with ADHD are not accepted are as follows;

Being excluded, scorned, or humiliated, physical and emotional violence by disturbed friends…T2. They have problems participating in activities and are excluded by some of their friends…S9.

Such children are generally social, but they do not know where to stand, maybe they are exposed to bullying because of this issue…T10.

According to the findings obtained from the teachers participating in the study, the views of secondary school students with ADHD on the solution to the problems they experience at school are shown in figure 2, the findings obtained from the NVIVO program.

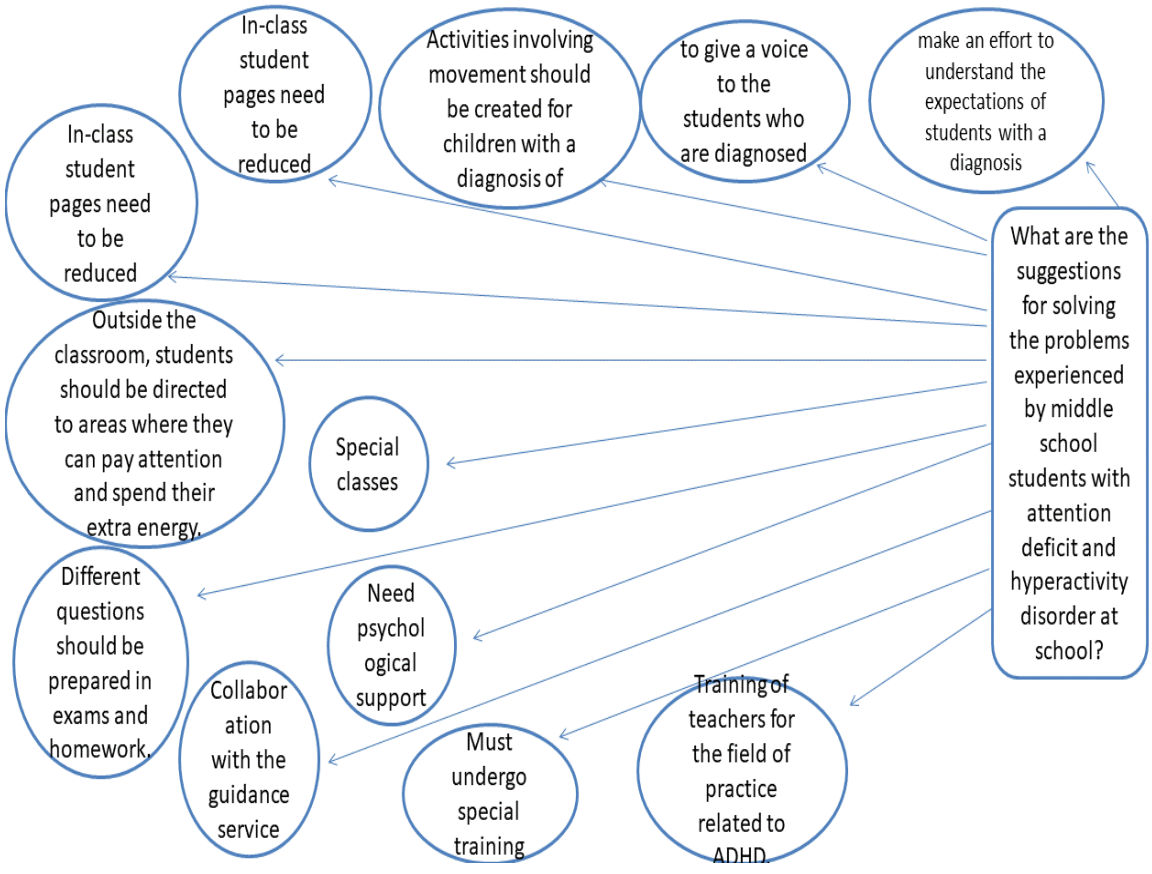

Figure 2. views of secondary school students with ADHD on the solution to the problems they experience at school

While teachers express their views on the solution to the problems experienced by secondary school students diagnosed with ADHD at school, they mostly relate to the need to train teachers for the field of practice related to ADHD, to increase school-family cooperation, to give importance to parent education, and to rearrange the curriculum and classroom materials by the needs.

Some of the answers given by the participants are as follows;

A consultation method can be applied in coordination with the families. School activities can be increased to help them spend their energy. In the course content, attractive arrangements can be made for such students...T10, First of all, these students need educators and administrators who are educated on this subject, and who can understand and feel them. It should be extended to special education teaching branches and the entire pedagogical formation ...T12, Perhaps attract his attention by adapting the curriculum to his interests, if possible. It may be to give education in small social groups ...T14, Professional help should be taken and they should be directed to certain sports branches ...T17.

DISCUSSION

In this section, the research findings supported by the literature are discussed. In this study, the educational, behavioral, emotional, and social problems experienced by secondary school students diagnosed with ADHD were investigated by taking the opinions of 35 teachers and their views on the solution to these problems were included.

In this study, the educational difficulties experienced by secondary school students diagnosed with ADHD were stated as the inability to focus, difficulty in listening to the lecture, and inability to concentrate. Moreover, they have difficulty following the academic process. Keeping up with the pace of the curriculum, not being able to take notes during the lesson, and missing important points are among the findings obtained. When the literature was searched, sources related

to similar findings were found. A short attention span, which is one of the main symptoms of ADHD diagnosis, negatively affects the performance and academic success of individuals with the diagnosis (Yıldız et al., 2010). In this study, academic failure due to not being able to focus is among the findings.

Yavuzer (2002), included studies emphasizing that the difficulties students experience in the areas of hyperactivity, impulsivity, and inattention negatively affect their learning skills, self-confidence, and self-esteem. Due to these difficulties, students start not being included in the class and are punished for this. Students with ADHD, whose acceptance is difficult as a result of the punishments received experience academic problems and a decrease in their success.

Çakar (2019), Çakar's study, he stated that students diagnosed with ADHD have a short attention span while doing a study, they behave impatiently and their participation is limited. He suggested that it would be appropriate to use methods other than traditional methods. These findings also support the findings obtained in this study. In this study, the emotional difficulties of secondary school students diagnosed with ADHD were stated by teachers as feeling lonely and worthless, inability to control their anger, instability in behavioral and emotional contexts, and lack of self-confidence in the academic field. When the relationship between the diagnosis of ADHD and Mood Disorder was examined in the literature, it was found that the rate of depression in female adolescents diagnosed with ADHD was 2.5 times higher than the population considered normal (Biederman et al, 2008). In studies conducted in Turkey, 12% of individuals diagnosed with ADHD have Mood Disorder and 7-9% of Depressive Disorder has been observed (Yüce et al., 2013; İnci et al., 2016). Emotional difficulties observed by teachers who cannot name them as diagnoses are actually among the contents of the diagnoses named in the literature. The emotional difficulties mentioned in this context are also supported by the literature.

Gümüş et al. (2015) found a significant relationship between ADHD and anxiety disorder in a study in which they examined the relationship between ADHD diagnosis and anxiety disorder. Lack of self-confidence in the academic field is also among the emotional difficulties. In a study in the literature, it was stated that children diagnosed with ADHD have some social difficulties such as not getting along with other children and having difficulties with learning and success at school (Wilens et al., 2002; Spencer et al., 2007; Massetti et al., 2008; Arnett et al., 2013). This study also supports the finding obtained.

The findings obtained from 35 teachers whose opinions were taken in this study show that problems in socialization and communication are at the top of the social problems that students with attention deficit and hyperactivity disorder generally encounter. Later, it is accompanied by symptoms such as having problems being accepted and being bullied. Some ADHD criteria in the DSM-IV, such as "often interrupting or interfering with others", emphasize the inadequacy of social behaviors and support the findings of this study. When the social relations of the students diagnosed with ADHD are examined, it is seen that they generally have communication difficulties and are exposed to peer bullying. Moreover, it is seen that they have difficulties communicating with their peers and developing close relationships due to the inadequacies in their social skills (Barber et al., 2005).

When the studies on teachers' opinions are examined, we find that students diagnosed with ADHD are described as incompatible, disruptive, naughty, incompatible, insufficient in social responsibility, and at high risk of social exclusion (Ayaz, et al. 2013). All these studies support the findings of this study. When we look at the opinions of the teachers in this study on the solution to the problems experienced by the students diagnosed with ADHD at school; Training of teachers in the field of practice related to ADHD, increasing school-family cooperation, and giving importance to parent education, rearranging classroom materials according to needs, addressing more sense organs with technological tools while teaching, being in cooperation with the guidance service, Students with a diagnosis should be given special education, they should be motivated by giving responsibility to students, they should be directed to areas where they can throw their energy out of the classroom, such as sports. When the literature was reviewed, it was stated that a comprehensive treatment in the treatment of ADHD diagnosis is possible with the use of multiple approaches including medication,

and educational, occupational, and behavioral interventions (Sadek, 2014).

At this point, we can mention approaches that focus on sports and exercise (Lufi & Parish-Plass, 2011). Sports lessons can be considered an alternative to energy expenditure (Mulrine & Flores-Marti, 2014). Especially in students diagnosed with ADHD, positive effects can be mentioned in the context of energy release (Hoza et al., 2016; Verret et al., 2012), and these activities related to this sport should be included in routine life (Zang, 2019). Göl and Bayık, 2(013) stated that classroom teachers are not at a sufficient level in recognizing ADHD. This research supports the finding of this study. Teachers should be trained on how to better teach individuals diagnosed with ADHD. Playgrounds are one of the effective strategies that teachers can use when creating a suitable learning environment for students diagnosed with ADHD (Selikowitz, 2009). Thanks to movement, the individual diagnosed with ADHD relaxes, relieves tension, can improve self-control skills, and thus increase school success (Yavuzer, 2018).

In studies on the diagnosis of ADHD, School functionality, social functionality, Emotional functionality, Self-esteem, Physical health, and Psychosocial health are among the findings in which problems are experienced (Danckaerts et al., 2010; Yıldız et al., 2010; Göker et al., 2011; Kandemir et al., 2014). All these research findings support the findings obtained in this study. It has emerged that social-emotional problems can be solved with the cooperation of teachers and families (Taspinar, 2019). In this study, in which educational, behavioral, emotional, and social problems related to the diagnosis of ADHD and teachers' views on solution suggestions were investigated, we see that common findings were encountered.

Conclusion

Recommendations Based on Research Results

Based on the results of this study, the following recommendations were developed:

• Education about the diagnosis of ADHD should become a state policy. With books, magazines, articles, conferences, and various in-service pieces of training, both families, educators, and the environment of the individual diagnosed with ADHD should realize their personal development.

• School-family cooperation should be considered inevitable.

• An Individualized Education Plan should be prepared based on different developmental characteristics.

• It is necessary to benefit from expert support and special education for the development of the student.

• Students diagnosed with ADHD should benefit from psychological support as well as special education support.

• Activities including physical activity should be increased.

• Family and child should be encouraged to psychiatrist support. In our age, it is inevitable for the Social Services Department to include this situation in the scope of child neglect.

• Classroom environments, curricula, and exam formats should be revised for students diagnosed with ADHD.

• To increase the efficiency of the special education support provided in schools, more special education teachers should take their place on the staff.

• Identifying problems is one of the first steps to be taken to reach a solution. There should be more specific and clear content while distinguishing emotional, behavioral, educational, and social problems in teacher training institutions or education about ADHD.

• For children with ADHD to be diagnosed at an early stage, it is very important to organize nationwide standard education in schools and to carry out screening studies on this issue.

Suggestions for Future Research

• It will be useful to get opinions from experts and to determine a training method by taking these opinions into account to eliminate social-emotional problems.

• Conducting similar studies with preschool students within the scope of prevention will benefit the field.

• It would be beneficial to conduct a more comprehensive study in institutions affiliated with the Ministry of National Education. There is a need for the study to be an experimental study, not only for theory but also for practice.

• Studies investigating the strengths of individuals diagnosed with ADHD to raise awareness will both underline individual differences and provide social and emotional support by drawing attention to strengths.

• For this research to be converted into an experimental study and included in the scope of a sample school project, a comparative study will be conducted by taking their opinions with the questions in the same content after the same study group was given training on the diagnosis of ADHD.

In conclusion, students diagnosed with attention deficit and hyperactivity disorder need special academic programs to improve their strengths and strengthen their weaknesses, as well as special programs for their social development. Elimination of these problems is possible as a result of a long-term study within the framework of state policy, made with school-family cooperation and expert support.

Conflict of interest

The authors declare no conflict of interest. No financial support was received.

Ethics Statement

The approval of the Scientific Research Ethics Committee of Near East University obtained for the study (Protocol number NEU/EB/2022/920).

Author Contributions

Study Design, HHKK; Data Collection, HHKK and YS; Statistical Analysis, HHKK; Data Interpretation, HHKK and YS; Manuscript Preparation, HHKK and YS; Literature Search, HHKK and YS. 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 Investigation of Relationship between Functional Mobility Levels of Children with Chronic Disability and Caregivers' Quality of Life

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Abstract
Purpose: This study aims to look at the relationship between carers' quality of life and the functional mobility levels of children with chronic disabilities.Methods: The study included 30 children (22 boys, 8 girls) with chronic disabilities and their caregivers. The socio-demographic characteristics of the children and caregivers were collected.Caregivers' quality of life was evaluated with the Adult Carer Quality of Life Questionnaire (AC-QoL), and children's functional mobility was evaluated with the mobility subscale of the Pediatric Evaluation Of Disability Inventory (PEDI-Mobility). Results: The age of the children included in the study was 7.0 (5.0-12.0) years and the age of their caregivers was 38.00 (32.75-41.25) years. The AC-QoL score of caregivers was 85.00 (72.00-93.50) out of a total of 120 points, and the PEDI-Mobility score was 33.00 (3.75-53.00) out of a total of 58 points. In the correlation analysis, no significant correlation was found between the PEDI-Mobility total score and the AC-QoL total score ($p>0.05$).However, there was a negative correlation between the PEDI-Mobility total score and the AC-QoL "ability to care" subscale score($r= -0.403$; $p=0.027$). Conclusion: According to the results of the study, no relationship was found between the functional levels of children and the quality of life of their caregivers. Studies with a larger sample size and consideration of aspects including sociocultural level, economic considerations, and health services that may affect the quality of life of families are regarded to be necessary in order to achieve more conclusive findings on this subject.

Keywords
Childrenwith Disabilities, Caregiver, Quality of Life

INTRODUCTION

Children with disabilities are ones whose neurological, physical, mental, sensory, social, and communicative abilities differ from those of an average or typical child. Therefore, they need professional help. (Sen and Yurtsever, 2007). These children with special care needs require constant attention from family members and healthcare professionals as they exhibit temporary or permanent physical, developmental, behavioral or emotional problems (Coller et al., 2020). Disability affects not only the child but also the family and caregivers physically, emotionally and socially, paving the way for them to experience multifaceted problems (Sen and Yurtsever, 2007).

Regardless of the degree of disability, this is a traumatic situation for the child and her/his family. Inappropriate reactions to this traumatic situation and the feeling of guilt in the family drag the parents into depression. At the same time, the need for extra time, money and energy for the care of the child causes the parents to experience

Received: 15 March.2023 ; **Accepted:** 27 May 2023; **Online Published:** 06 June 2023
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How to cite this article: Ahmadov, R., Demir, N., Kurt, M. and Tarsuslu, T. (2023). The Investigation of Relationship between Functional Mobility Levels of Children with Chronic Disability and Caregivers' Quality of Life. *Int J Disabil Sports Health Sci*;2023;6(2):218-225.https://doi.org/10.33438/ijdshs.1265907

stress and negatively affects the quality of life (Cangür et al., 2013).

Caregivers take on a crucial responsibility to help chronically disadvantaged kids who struggle with daily challenges (Yilmaz et al., 2013). Bringing up a child with disability, raising her/him and meeting her/his needs throughout her/his development affect all members of the family (Stevenson et al., 2006). However, in this process, mothers are more affected by this situation as they are generally the primary caregivers of the child (Ones et al., 2005). It is stated that the experimentation and expectations of children's family with disability vary according to the mother and father. Mothers, who are primarily responsible for the care of the child, take a more active role in solving the difficulties they face and show more effort (Hastings, 2003; Byrne et al., 2010). Various health problems may occur and emotional changes may occur in mothers with disabled children who cannot spare enough time for themselves due to the care of their disabled child (Sertel et al., 2016). Caring for a child with long-term functional limitations can affect mothers' quality of life, and thus poor maternal health may result in decreased work productivity and increased health care costs. This may affect the child, family and society negatively (Tekinarslan, 2013).

It is seen in the literature that caregivers of disabled children face more mental and physical difficulties than those who care for healthy children (Bourke-Taylor et al., 2012). One of the factors that can affect the quality of life of caregivers is the functional competencies of the child with disability. However, there is no consensus in the literature on this issue. Based on this subject, our study aimed to examine the relationship between the functional mobility levels of children with chronic disabilities and the quality of life of their caregivers.

MATERIALS AND METHODS

Participants

In this cross-sectional study, 30 children with chronic disabilities between the ages of 0-18 who participated in physical therapy and rehabilitation programs in special education and rehabilitation centers and their caregivers were included. Inclusion criteria of chronically disabled children; physical, mental, or both were considered chronic disabilities, being between 0-18 age, and voluntary to join to the study. Exclusion criteria; not wanting to participate in the research and not having the ability to follow the verbal instructions given to her/him. Inclusion criteria of caregivers; having a child with physical, mental, or both, who is considered a chronic disability, being able to read and write in Turkish, and agreeing to participate in the research voluntarily. The exclusion criteria are; not accepting to participate in the study, having communication problems, having any psychiatric disorder and having recently experienced an event that may significantly affect the quality of life. In order to carry out the study, ethics committee permission was obtained from the Non-Interventional Research Ethics Committee of Dokuz Eylül University with the decision number 2023/01-09 dated 04.01.2023. Before the study, the children to be included in the study and their caregivers were informed about the purpose of the study and the evaluation method. Written informed agreement was acquired from the families for this study in following with the guidelines set out in the Declaration of Helsinki.

Data collection tools

Within the scope of the study, the socio-demographic characteristics of the children and their caregivers were questioned using the form created by the researchers. The quality of life of the caregivers was evaluated with the Adult Carer Quality of Life Questionnaire (AC-QoL), and the functional mobility level of children was evaluated with the Mobility sub-title of the Pediatric Evaluation of Disability İnventory (PEDI-Mobility).

Adult Carer Quality of Life Questionnaire

It was developed by Stephen Joseph et al. (Joseph et al., 2012). The questionnaire examines the quality of life under 8 sub-titles and consists of 40 questions. Each question can be answered as "never", "sometimes", "often" and "always". The highest score that can be obtained from the questionnaire is 120. The scores obtained after scoring are classified as 0-40 points denoting low quality of life, 41-80 points expressing average quality of life, and 81-120 points expressing high quality of life. The Turkish reliability and validity of the questionnaire was carried out by Gencer (Gençer, 2020).

Pediatric Evaluation of Disability Inventory

The Pediatric Evaluation of Disability İnventory is a clinical assessment tool used to evaluate functional abilities, performance and

changes in functional skills in children with disabilities between the ages of 6 months and 7.5 years, and it is also a frequently used tool in the assessment of older children in case of functional delay (Haley et al. , 2010). The Turkish validity and reliability study of the scale was performed by Erkin et al. (Erkin et al., 2007). The scale is divided into 3 main titles: functional skills, help of caregivers and modifications. Functional skills subheading consists of 197 questions. This sub-section is organized as Self-Care subsection 73, Mobility subsection 59 and Social Functions subsection 65 items. The Caregivers' Help section consists of 20 questions and scores are made according to the amount of help the child needs during functional abilities. The modification section includes 20 questions on the environmental regulations that the child uses while performing his/her daily life skills. Each question is scored as 0 = cannot, 1 = can. Scoring can be done during the interview with the family, as well as following the observation of the behaviors by the physiotherapists. The subscales of the PEDI can also be applied separately from each other. In this study, the "Mobility" subscale within Functional Skills was used to determine the functional mobility levels of individuals with chronic disabilities.

Statistical analysis

The data obtained from the research were analyzed with the Statistical Package for Social Sciences (SPSS®) Windows 24.0 package program. The conformity of the data to the normal distribution was evaluated with the Shapiro-Wilk test. Descriptive statistics were given as the median (IQR25/75). Spearman Correlation test was used to determine the relationship between functional mobility level of children and quality of life of caregivers. The sample size of the study was calculated as a minimum of 29 participants using the G* Power 3.1 software by taking 85% power, α=0.05, correlation pH1=0.48 and correlation pH0=0.00.

RESULTS

Thirty children (22 boys and 8 girls) with chronic disabilities and their mothers were included in this study.All caregivers included in the study were mothers. The mean age of the children included in the study was 7.0 (5.0-12.0) and the mean age of their mothers was 38.00 (32.75-41.25). 93.3% of the mothers were married. The participants' general characteristics are given in Table 1 and Table 2.

Table 1. Socio-demographic and clinical characteristics of children with disabilities

n=30		*n*	*%*
Age (median – IQR 25/75)		7.00 (5.00 – 12.00)	
Gender	Female	8	26.7
	Male	22	73.3
Diagnosis	Cerebral Palsy	15	50.0
	Autism Spectrum Disorder	5	16.7
	Delayed Development	4	13.3
	Other	6	20.0

IQR25/75: Interquartile Range25th 75th Percentile

Table 2. Socio-demographic characteristics of caregivers of children with disabilities

n=30		*n*	*%*
Age (median – IQR 25/75)		38.00 (32.75 – 41.25)	
Marital Status	Married	28	93.3
	Single	2	6.7
Education Status	Uneducated	2	6.7
	Primary School	9	30.0
	Secondary School	4	13.3
	High School	10	33.3
	Associate Degree	1	3.3
	Bachelor's Degree	3	10.0
	Master's Degree	1	3.3
Number of Children	One	9	30.0
	Two	11	36.7
	Three	8	26.7
	Four	2	6.7

IQR25/75: Interquartile Range 25th 75th Percentile

AC-QoL total score median score was 85.00 out of 120.00. PEDI Mobility's total score median score was 33 out of 58. The median and interquartile range values of the subscales are given in Table 3.

Table 3. Scores of PEDI and AC- QoL

	Median	(IQR25/75)
PEDI - Mobility	33.00	(3.75-53.00)
AC-QoL Total Score	85.00	(72.00 - 93.50)
Support for caring	10.50	(4.75 – 12.00)
Caring choice	9.00	(4.75 – 12.00)
Caring stress	10.00	(6.50 – 12.50)
Money matters	5.30	(3.75 – 8.00)
Personal growth	12.00	(10.00 – 15.00)
Sense of value	14.00	(10.75 – 15.00)
Ability to care	12.00	(9.75 – 13.25)
Carer satisfaction	14.00	(12.75 – 15.00)

IQR25/75: Interquartile Range 25th 75th Percentile, PEDI – Mobility: Mobility Subscale of Pediatric Evaluation of Disability Inventory, AC-QoL: Adult Carer Quality of Life Questionnaire

No relationship was found between mothers' quality of life and the functional mobility levels of their children. There was a moderate negative correlation between the PEDI-Mobility total score and the AC-QoL "ability to care" subscale score ($p<0.05$) (Tablo 4.)

Tablo 4. Correlation between caregivers' quality of life and chronic disabled children's PEDI mobility scores

		PEDI - MOBILITY
AC-QoL Total Score	r	-0.287
	p	0.124
Support for caring	r	-0.048
	p	0.801
Caring choice	r	0.185
	p	0.326
Caring stress	r	-0.140
	p	0.461
Money matters	r	-0.251
	p	0.180
Personal growth	r	-0.188
	p	0.320
Sense of value	r	-0.250
	p	0.183
Ability to care	r	-0.403*
	p	0.027*
Carer satisfaction	r	-0.281
	p	0.133

DISCUSSION

This study aims to investigate the relationship between the functional mobility levels of children with chronic disabilities and caregivers' quality of life.We found a moderate negative correlation between the PEDI-Mobility total score and the AC-QoL "ability to care" subscale score ($p<0.05$). Caring for a child with a chronic disability is a rather time-consuming activity, mothers quit their jobs(Caicedo, 2014), and restrict their social life to maintain it. Chronic conditions can be seen with many complications. This may increase health expenditures for children with chronic disabilities (Lindley and Mark, 2010). As a result of this situation, caregivers may experience financial stress (Barutcu et al., 2021). Studies showed severe disability makes this cost bigger, but we didn't find any relationship between Money matters subscale of AC-QoL and PEDI Mobility.The reason for this situation may be the

financial situation of the participants. Future studies should examine the effect of ''income status'' on quality of life.

Chronic disabled child's care getting harder year by year. Our sample's mean age was 7.00. Literature suggest that mother's quality of life decreases with children's age (Bumin et al., 2008). Maybe this is one of the reasons we don't have any correlation between other parameters.

Studies showed that the physical abilities of a child are important factors that affect mother's quality of life (Dehghan et al., 2016). In our study %50 of the participants were diagnosed with Cerebral Palsy. Cerebral Palsy is a developmental disability that has difficulties with motor skills and also they may have cognitive, and sensory impairments (Gulati and Sondhi, 2018). The complexity of disability affects parents' well-being in more than one problem (Isa et al., 2013). These consequences result in dependence on the caregiver. Therefore, we expected to find the statistically important difference between functional mobility and mother's quality of life. . Studies in the literature found that functional level association between lower quality of life (Sonune et al., 2021; Yilmaz et al., 2010). In a study conducted by Sonune et al., in which the relationship of depression and quality of life of mothers of children with cerebral palsy were examined with the functional level, it was found that the quality of life was significantly affected by the functional level(Sonune et al., 2021).

But, our findings weren't consistent with the literature. In another study, the quality of life of the families of children with learning disabilities, mental retardation, autism spectrum disorder, and physical disability was compared. It was found that the worst quality of life is in families whose child has autism spectrum disorder, and families of children with physical disabilities have the best quality of life after families who had child with learning disability (Haimour and Radi, 2012).

In current study we didn't find any relationship between functional level and mother's quality of life. This may be due to the fact that our group of participants was heterogeneous. We have physically and mentally disabled children in this study. Children with Autism Spectrum Disorder have better functional levels than physically disabled children. Disease characteristics, complications, and treatment regimes have important effects on quality of life and show differences with disability type.For instance, in a study conducted by 203 children with cerebral palsy in Iran, it was found that the quality of life of mothers decreases as the child's level of impariments increases (Farajzadeh et al., 2020).

Most of the studies in the literature focus on the negative aspects of caregiving. Although caregiver's demands are challenging, studies cited that positive aspect of caregiving(Schulz and Sherwood, 2008; Shirai et al., 2009). Helping a person who had a disability makes them feel good and useful. Caregivers experience satisfaction because of this situation. Some of them use it as a coping strategy(Li-Tsang et al., 2001). The results of this study also support this situation in the literature. We found a moderate negative correlation between the PEDI-Mobility total score and the AC-QoL "ability to care" subscale score ($p<0.05$).

Our study have some limitations. First, this study only contains chronically disabled children and their mothers who live in İzmir. To generalize the results we need another study from other cities in Turkey. In order to reach more solid evidence on this subject, it is thought that studies that will take into account factors such as larger sample size and sociocultural levels of families are needed.

Second, mothers are primary caregivers in Turkey, and because of this reason, we included only mothers (Ones ve ark., 2005). Future studies should add caregiver fathers will enable the investigation of the effect of the gender factor on the quality of life.

In conclusion our study supported that caregiving may have positive effects on mothers' ability to care, depending on the child's functional level. In this direction, informing and training families about caregiving will be an important step as it can increase the quality of life of mothers by supporting the results of our study.

Acknowledment

Authors thank all the children and parents who joined in this academic work.

Conflict of interest

No disagreement of interest is said by the writers. In addition, no financial support was received.

Ethics Committee

(Date: 04.01.2023; Decision number: 2023/01-09). Participants who volunteered for the study were informed with a written informed consent form.

Author Contributions

Study Design, RA, ND, TT; Data Collection, RA, ND; Statistical Analysis, MK; Data Interpretation, RA, ND, MK, TT; Manuscript Preparation, RA, ND, MK, TT; Literature Search, RA, ND, MK, TT. 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

Physical Activity Involvement and Children with Autism Spectrum Disorder: Turkish Validity and Reliability of Parent-Reported Involvement Scale

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Abstract
The aim of this study was to test Turkish the validity and reliability of Parent-Reported Involvement Scale: PRIS, and to determine activity involvement level of children with autism who have training table tennis as physical activity. Data were collected from 126 parents who have a child with autism. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were respectively used to test factor structure of the scale in Turkish language. The structure with 3-factor of the scale was analyzed by the Maximum Likelihood and Cronbach's alphas was calculated for the subscales to evaluate its internal consistency. In addition, correlation between factors were examined with Pearson Correlation Analysis. According to conducted EFA results, the model consisted of 3 subscales. The CFA results proved that model fit indexes (χ^2/df= 2.05, GFI= .88, CFI= .88, NFI= .91, SRMR= .09, RMSEA= .09) were within perfect compliance limits with acceptable and supported 3-factor structure of the scale. In addition, the factor loadings of the scale ranged from .48 to .98 and the Cronbach Alpha reliability coefficients were respectively measured as .87, .86, and .87 for "interest intensity", "social bonding" and "identity expression" sub-dimensions. According to the results obtained, it could be assumed that structure with the 3-factor of the PRIS was a valid and reliable measurement tool todetermine level of leisure involvement of children with autism towards leisure activity. Consequently, it may think that PRIS could be used in Turkish samples in the future research with autism children.

Keywords
Autism, Involvement, Leisure, Reliability, Validity

INTRODUCTION

The conceptual structuring of involvement insocial psychology has caused social sciences to be discussed with different dimensions in marketing, consumer behavior and advertising, which are closely related to human behavior and attitudes, especially between 1965- 1980 (i.e., Sherif et al., 1965). Therefore, each discipline has developed different definitions and classifications of involvement according to its own perspective and research focus. With therapid development of recreation in the world economy and it beginsto be perceived as a consumption-basedproduct model in thelives of societies (Odabası& Baris, 2002), leisure literature began to address involvement in the mid-1980s (Decloe et al., 2009; Havitz & Dimanche, 1997).

Involvement, which is defined as the attitudes that an individual learns and develops through her link to her social environment, has been frequently used by leisure researchers to determine which stimuli are more important or meaningful to people (Reyes Uribe, 2017; Sherif

Received: 21 March.2023 ; **Accepted:** 24 May 2023; **Online Published:** 07 June 2023
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How to cite this article: **Aydın, İ. and Gümüşboğa, İ. (2023).** Physical Activity Involvement and Children with Autism Spectrum Disorder: Turkish Validity and Reliability of Parent-Reported Involvement Scale. *Int J Disabil Sports Health Sci*;2023;6(2):225-237..https://doi.org/10.33438/ijdshs.1268971.

et al., 1965; Kyle, 2001). The studies (i.e., Hammer & Sauter, 2013) have released that it is necessary to determine what kind of benefits activities provide to individuals to understand more clearly the reasons why people are interested in activities. Participation in an activity, especially by physical activities, provides numerous benefits to individuals in many aspects such as physiological, mental, social (Deneau et al., 2019; Izenstark & Ebata, 2019) and influence positively on especially their healthiness levels (Broughton et al., 2017). Therefore, research has proved that participation in leisure activities, which is regarded as a personal experience (personal relevance) for each person (Cockerill, 1995) is directly affect even the life satisfaction which is defined as satisfaction with people's lives (Diener et al., 1985; Driver, 1997).

For this reason, it has been extremely effective in increasing the number of studies in different culture and sample groups in leisure literature that participation in leisure activities contribute to the life of individuals(i.e., Akyüz, 2020; Gurbuz & Henderson, 2014; Gurbuz & Henderson, 2013; Kara et al., 2019; Kim % Park, 2018; Yaşarturk et al., 2020; Zhou, 2010). Leisure activities have been known as an important position for autism spectrum disorderlikein all individuals (Hollander & Nowinski, 2003). Especially, participation in leisure physical activity contributes positively to the social development of individuals with ASD and reduces their stereotyped behaviors (Orsmond et al., 2004).Numerousstudies have proved that individuals with ASD have improvements in their general health status, behavioral disorders, and motor skills with physical activity (Bremer et al. 2016; Lang et al., 2010)

It is not always possible to evaluate the behaviors, preferences, or reasons of psychological involvement of children with ASD, which is neuro developmental disorders. Therefore, Sheldrick et al. (2012) mentioned three methods that should be considered when evaluating the involvement of children with ASD in a certain physical activity. These are respectively as follows; (I) self-report, which a child give answer about their own involvement; (II) standard parent report, which a parent give answer about to what extent the child's involvement perceive; and (III) parent proxy report, which parents are asked to foresee what kind of response they can give when it comes to their children's direct involvement. Although it is thought that the best way to collect information from children with disabilities is through self-report (Sheldrick et al., 2012), recently it has been asserted that it is possible to evaluate the behaviors, preferences, or reasons for psychological involvement of children with ASD towards leisure activities due to their neurodevelopmental disorders with a parent-report.Consequently, our study's purpose was to test the Turkish reliability and validity of the "Parent-Reported Involvement Scale: PRIS", which was developed to determine the involvement level of children with ASD towards table tennis training program as physical activities.

Conceptual backgroun

The development process from modified involvement scale: MIS toparent-reported involvemen tscale: PRIS

In leisure literature, the first studies on leisure involvement have been focused more on scale development (Kyle et al., 1999). Consumer Involvement Profile: CIP (Kapferer and Laurent, 1985a) and The Personal Involvement Inventory: PII (Zaichkowsky, 1985) have been preferred to evaluate the level of individuals' involvement about recreational activities in the first scales developed (Havitz& Dimanche, 1997, Kim et al., 1997; McIntyre, 1989). However, different studies have been carried out later by developing different measurement tools (Havitz et al., 1993; Kyle et al., 2007).

The process of the personal involvement inventory: PII

Zaichkowsky (1985) posited that a person's involvement falls into three categories. These are I) personal: featuring inherent interests, values or needs that motivate one toward an object, II) physical: occurring when characteristics of the object cause differentiation and increase interest and III) situational: which is when something temporarily increases the relevance toward an object. A scale was developed from these three aspects of involvement, utilizing twenty pairs of words describing an object. The pairs of adjectives are designed to be indicative of high and low states of involvement (e.g., trivial: fundamental; and boring: interesting). Respondents were asked to react to the semantic differential between the words and select the point on a seven-point scale where their opinion falls. The sum of their responses could be calculated to produce an engagement score for each person.

The PII provides a unidimensional understanding of an activity's importance on a continuum of low to high.

The PII has entered the leisure literature with Celsi and Olson's (1988) inquiry into involvement and consumers' reaction to promotional materials targeted at tennis players. Though early leisure involvement research regularly employed the PII and related scales (Backman & Crompton, 1989; Bloch et al., 1989, Havitz et al., 1993; Jamrozy et al., 1996; Kim et al., 1997; McCarville, 1991), it has become overlooked for the multidimensional CIP in time (Havitz et al., 1993; Havitz& Dimanche, 1997). After assessing 50 involvement studies published from 1988 to 1997, Havitz and Dimanche (1997) have determined that the multidimensional CIP has been preferable to the unidimensional PII citing stronger content and face validity. However, even recent inquiries into leisure involvement have utilized the PII for its simplicity (Laverie& Arnett, 2000).

Consumer involvement profile: CIP

Kapferer and Laurent (1985a, 1985b), who have accepted involvement as a crucial variable in consumer behaviors, developed the CIP French Form, which is a multidimensional structure and based on Rothschild's (1979) work, to comprehend the relationship of product and consumer much better. CIP, which can be used to determine not only the level of consumers' involvement but also the person-to-person differences in their involvement patterns, has five dimensions serving as antecedents of involvement: 1) sign: the symbolic value of the consumer towards the product or its consumption and its purchase. 2) pleasure: the emotional appeal of a product, its hedonic value, and its ability to provide affect, 3) importance: the importance of the product to the customer's perception of the product, 4) risk importance: the importance of negative consequences experienced after the customer purchases the product, and 5) risk probability: the probability that the customer chooses a product with negative characteristics. Evaluated many times in the consumer marketing literature (Higie& Feick, 1989; McQuarrie & Munson, 1987; Mittal, 1995), CIPwas first translated into English by Jain and Srinivasan (1990), then later Rodgers and Schneider (1993). Finally, it appeared to result in a four-dimensional structure. After these studies, Dimanche et al. (1991) thought that CPI was also suitable for leisure literature; some researchers have stated that new measurement tools which includes the properties of leisure literature is needed instead of directly using such scales for leisure research (Chang & Gibson, 2011, Kyle et al., 2007, McIntyre, 1989).

McIntyre (1989) proposed a recreation-based involvement profile that consists of four sub-dimensions: centrality to lifestyle, importance, self-expression, and pleasurein the research regarding campers. Pleasure and importance dimensions are the same as Kapferer and Laurent's dimensions in PII, while the self-expressionis close to the sing dimension of CIP (Ridinger et al., 2012).In addition, the centrality to lifestyle dimension was also included in the study since personal interest/relevance has been accepted as an important element in leisure activities (Wellman et al., 1982), but risk consequence and risk probability dimensions were not included in the model without any explanation. McIntryre (1989) removed the risk dimension and included the centrality to lifestyle dimension in the study and brought a new consumer behavior scale to the literature that can be used to research the relationship between involvement and leisure.However, with the second factor analysis performed by McIntyre and Pigram (1992), the items in the pleasure and importance dimensions have been renamed as attraction because they were loaded on the same factor. As a result, McIntyre (1989), McIntyre and Pigram (1992) introduced a three-dimensional scale of involvement, namely self-expression, centrality, and attraction, into the leisure literature and used in the conceptualization of other studies. A Modified Involvement Scale: MIS developed by Kyle et al. (2007) has been one of them.

A modified involvement scale: MIS

MIS seen as an important advance in measuring leisure involvement, and it consists of five dimensions: attraction, centrality (McIntyre, 1989; McIntyre &Pigram, 1992), identity expression (Kapferer& Laurent, 1985a), social bonding, and identity affirmation. Researchers have included social bonding and identity affirmation as dimension because of measuring leisure involvementalongside of the three frequently used sub-dimensions (Kyle & Chick, 2002). Consequently, these items such as centrality, self-expression, and attraction have released different aspects of involvement. These three dimensions could be used in various fields as a means of creating a profile of individuals'

involvement (Wiley et al., 2000). However, by creating two different sub-dimensions from McIntyre's (1989) self-expression dimension, MIS has revealed a great conceptual change in the concept of involvement in the leisure literature and has been used by various researchers in recent years in creating an involvement profile for leisure activities (Arnberger et al., 2019; Jun et al., 2012; Williams, 2013).

Process of parent-reported involvement scale: PRIS

Developed over time with the contribution of various researchers to evaluate the involvement and personal meaning in various leisure activities such as exercise, fishing and video games, MIS was adapted by Hickerson et al. (2014) to determine the leisure involvement levels of children with autism, which is the marginal group. However, it is striking that three main changes were performed to the scale (I) most items on the scale have a "My child appears to..." expression because families filled the scale instead of children, and (II) The identity affirmation factor is not included in the scale. Kyle et al. (2007)'s instrument measures the extent to which an individual confirms his or her identity through participation. A parent could not evaluate this concept for their children. However, the outward expression or identity expression of identity associated with the activity could be observed by parents, (III) and lastly attraction and centrality factors of MIS are accepted as the only factor called interest intensity.

MATERIALS AND METHODS

Data collection and participant

The study was confirmed by Bartın University Social and Human Sciences Ethics Committee which is a recognized review board or ethics committee on February 09, 2023 (Approval no: 2023-SBB-0051).

The study group of the research consisted of 126 parents who have children with ASD. Characteristics of ASD were between the ages of 5-18 and participate in several physical activity training programs within a sport club in Ankara. The parents in this study group, which was created by using the criterion sampling method that is one of the purposeful sampling methods, were determined according to several criteria. In process of determining these criteria, the criteria such as that“the child with ASD is between the ages of 5 and 18”, “children with ASD have been involved in table tennis activity for a year or more” and “participate in this activity at least two days a week” were taken into consideration. A scale form consisting of personal demographic information and Likert type items was applied to the parents to investigate the table tennis behavior of children with ASD and to evaluate their children's perceptions of playing table tennis.

The average age of the parents participating in the study (M = 43.00, SD = 4.97), 84.9% of them were women, 95.2% were married, 83.3% were university graduates, and the average age of their children with ASD (M = 12.00, SD = 2.85), 84.9% of them were male, hours of weekly table tennis playing (M=10.00, SD=4.46), and 69.8% of them were found to have a moderate level of autism (see Table 1).

Table 1. Description of variables and participant characteristics

Continuous Variables	**M**	**SD**	**Min**	**Max**
Respondent age	43.00	4.97	56	32
Child age	12.00	2.85	5	17
Hours of table tennis played per week	10.00	4.46	4	25
Categorical Variables			**%a**	**%b**
Respondent sex (a=male; b=female)			15.1	84.9
Respondent status (a= single; b= married)			4.8	95.2
Respondent education (a=High school; b=University)			16.7	83.3
Child sex (a=male; b=female)			84.9	15.1
Child ASD classification (a= mild; b=moderate)			69.8	30.2

Note: M= mean, SD= standard deviation

Measures

Data collection tool

Parent-Reported Involvement Scale: PRIS adapted by Hickerson et al. (2014) was used. The scale, which it was tested whether the level of leisure involvement of children with ASD could be evaluated with the parent-report, measured using a Likert-type format where 1= Strongly disagree and 5= Strongly agree, PRIS is a scale that is 3 sub-dimensions and 12-items.

Process of scale's translation from English to Turkish

Translation and back-translation method were used to create the Turkish of the items in PRIS. At this stage, items in the original scale were translated into Turkish by 3 specialists in their English language field. Then later, these three forms translated were individually evaluated by 3 judges, the most appropriate of items were asked to mark by them. Traits of these judges were specialists in their scale adaptation study field and the level of their English is high. The Turkish form created at the end of this stage was later translated into English by an academic with a high level of English grammar, and its equivalence was tested with the original form. The pilot application of the Turkish form that was created because of all these stages was performed, the comprehensibility of items was reviewed, and the final scale form was composed (see Table 2).

Table 2. Items and factor domains in English and Turkish

English items and factor domains		Turkish items and factor domains	
Interest Intensity (II)		**İlgi Yoğunluğu (IY)**	
II_1	Table tennis appears to occupy a central role in the life of my child with ASD	IY_1	Masa tenisi, OSB'li çocuğumun hayatında merkezi bir role sahiptir.
II_2	Table tennis appears to be one of the most satisfying things my child with ASD does	IY_2	OSB'li çocuğumun yaptığı en tatmin edici şeylerden birisi masa tenisi oynamaktır.
II_3	My child with ASD appears to be genuinely interested in playing table tennis	IY_3	OSB'li çocuğum masa tenisi oynamakla gerçek anlamda ilgilenir.
II_4	My child with ASD appears to structure his or her daily routine around playing table tennis	IY_4	OSB'li çocuğum günlük rutinlerini masa tenisi oynayarak şekillendirir.
II_5	Table tennis appears to be very important to my child with ASD	IY_5	Masa tenisi, OSB'li çocuğum için çok önemlidir.
II_6	My child with ASD appears to invest most of his or her energy in table tennis	IY_6	OSB'li çocuğum, masa tenisi oynayarak enerjisinin çoğunu harcar.
Social Bonding (SB)		**Sosyal İlişki (Sİ)**	
SB_1	Table tennis provide opportunities for my child with ASD to be with acquaintances	$Sİ_1$	Masa tenisi, OSB'li çocuğuma arkadaşlarıyla bir rada olma fırsatı sağlar.
SB_2	Most of the acquaintances of my child with ASD play table tennis	$Sİ_2$	OSB'li çocuğumun arkadaşlarının çoğu masa tenisi ynar.
SB_3	My child with ASD appears to enjoy discussing table tennis with his or her acquaintances.	$Sİ_3$	anıdıkları ile masa tenisi hakkında tartışmak, OSB'li çocuğumun hoşuna gider.
SB_4	My child with ASD appears to prefer to be around others who share his or her interest in table tennis	$Sİ_4$	OSB'li çocuğum masa tenisine ilgisi olan kişilerle ir arada olmayı tercih eder.
Self-Expression (SE)		**Kendini İfade (Kİ)**	
SE_1	Table tennis appears to have enhanced the self-image of my child with ASD	$Sİ_1$	Masa tenisi oynamak, OSB'li çocuğumun benlik aygısını artırır.
SE_2	Playing table tennis appears to allow my child with ASD to express him or herself	$Sİ_2$	Masa tenisi oynamak OSB'li çocuğumun kendisini fade etmesine fırsat sağlar.

Process of data analysis

The data collected were computerized to evaluate in SPSS-23 and AMOS-19 statistical package programs. Maximum Likelihood (ML) parametric estimation method was applied in the study because of the multivariate distribution of normality of the collected data. Firstly, Exploratory Factor Analysis (EFA) was used to determine the factor structure of the scale translated into Turkish; Confirmatory Factor Analysis (CFA) was conducted to test model fit and validate factor structure.In addition, Cronbach's Alpha coefficients were determined for the internal reliability of the Turkish form. In addition, the Composite Reliability (CR) for the scale's structure reliability and the AverageVariance Extracted (AVE) for the convergence validity and discriminant validity were calculated in the study.

RESULTS

Descrpitive result

KMO (*Kaiser-Meyer-Olkin Measure of Sampling Adequacy*), which was made to determine the suitability of the data for factor analysis, was found as .84. Additionally, it was determined that the chi-square (X2 (66) = 940.427; p <.00) was significant when the *Barlett Sphericity* test results were examined. These values provided a criterion about whether the data can be modeled with factor analytical model or not. According to Field (2000), these values exhibited that the sample size determined for factor analysis was "good". According to the EFA results, the factor loads of the sub-dimensions in PRIS varied between .68-.82 for the "interest intensity" sub-dimension, .83-.87 for the "social bonding" sub-dimension, and .85-.86 for the "self-expression" sub-dimension (See Table 3). Also, item "*My child with ASD appears to enjoy discussing table tennis with his or her acquaintances*" which is in factor named "*social bonding*" was removed from the analysis process since the factor load of the item is overlapping (Buyukozturk, 2011).

Table 3. Exploratory factor analysis of PRIS

Items and factor domains	Factor 1	Factor 2	Factor 3
Interest Intensity (II)			
II_1	.82		
II_2	.79		.35
II_3	.73		.42
II_4	.73	.38	
II_5	.70		
II_6	.68		
Social Bonding (SB)			
SB_1		.87	
SB_2		.84	
SB_3	.35	.51	.48
SB_4		.83	
Self-Expression (SE)			
SE_1			.86
SE_2	.30		.85

Note: **Binaryitems

CFA results proved that the factor load of the sub-dimensions in PRIS varied between .48-.95 for the "interest intensity" sub-dimension, .77-.90 for the "social bonding" sub-dimension, and .79-.98 for the "self-expression" sub-dimension. It was determined that the lowest mean was "identity expression" (M = 3.99) and the highest mean was "interest intensity" (M = 4.11) at the level of sub-dimensions (see Table 4). Also, the result of CFA demonstrated that modifications were needed between some items so that the model could set good fit (see Figure 1). After modifications, obtained model fit values were respectively; $\chi 2/df$= 2.05, p<.00; RMR= .06; SRMR= .09; CFI= .95; GFI= .88; NFI= .91; TLI= .93; RMSEA= .09.Researchers have determined that these modelfit values were within acceptable limits (i.e., Hair et al., 2010; Hooper et al., 2008, Tabachnick&Fidell, 2006).Theoretically, such modifications could be created between the error terms of these items, since such a relationship could be mentioned between the items mentioned above (Kyle et al., 2007). Factor structures of PRIS were presented in Figure 1.

Reliability and validity results

The scales' the Cronbach's alpha coefficient was determined to be between .86 and .87. In addition, under convergent validity the AVE was calculated as 0.55 for the "interest intensity" sub-dimension, .57 for the "social relationship" sub-dimension, and .74 for the "self-expression" sub-dimension (see Table 5). It could be expressed as a proof for the reliability of the measurement results if the reliability level of a dimension was (<.70) (Hair et al., 2010). Also, there was a positive correlation between the sub-dimensions of PRIS when Table 5 was considered.

Table 4. Confirmatory factor analysis ofPRIS

Items and factor domains	M	SD	R^2	t-value
Interest Intensity (II)	4.11	.62		
II_1	4.13	.69	.89	12.73**
II_2	4.13	.75	.94	13.86**
II_3	4.13	.88	.83	11.29**
II_4	3.99	.87	.50	5.86**
II_5	4.15	.75	.53	6.27**
II_6	4.11	.83	.48	5.50**
Social Bonding (SB)	4.11	.71		
SB_1	4.11	.90	.89	11.84**
SB_2	4.20	.88	.81	10.44**
SB_4	4.14	.74	.77	9.70**
Self-Expression (SE)	3.99	.84		
SE_1	4.00	.90	.79	9.20**
SE_2	3.99	.89	.98	11.60**

Note: M= mean, SD= standard deviation, **p<0.00

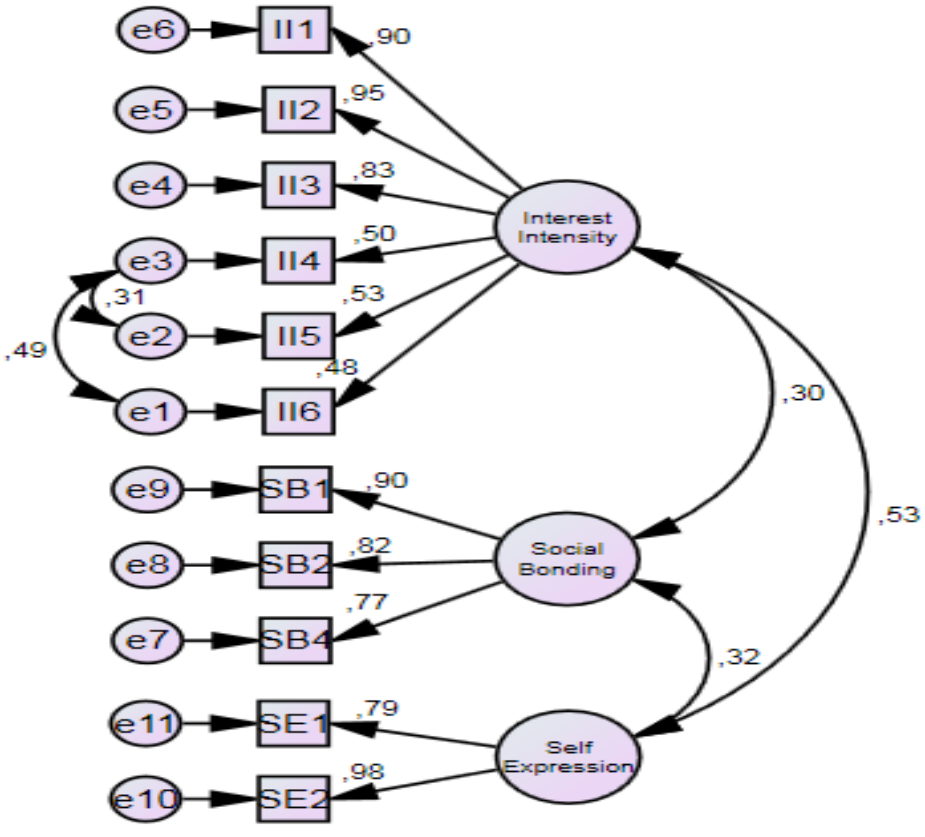

Figure 1. Standardized SEM analysis

Table 5. Factors' correlations, internal consistency reliability, AVE and CR scores of PRIS

	1	2	3	α	CR	AVE
1.Interest Intensity	-	.47**	.50**	.87	.88	.55
2.Social Bonding		-	.47**	.86	.82	.57
3.Self-Expression			-	.87	.85	.74

Note: M= mean, SD= standard deviation, CR= composite reliability, AVE= Average variance extracted, **p<.00s

The fact that the AVE calculated for convergence validity was greater than (<0.50) has been accepted as proof of convergence validity (Fornel& Larcker, 1981; Peterson, 2000). Correlations between sub-dimensions and square root of AVE were used for discriminating validity. Accordingly, the square root of AVE in any dimension should not be less than the correlation between that dimension and the other dimension, at the same time it should not be less than .50 (Fornel& Larcker, 1981). It was determined that the values calculated for the scale provided convergence validity and discriminative validity (see Table 6).

Table 6. Discriminant validity of PRIS

	1	2	3
1.Interest Intensity	**.74**		
2.Social Bonding	.47	**.75**	
3.Self-Expression	.50	.47	**.86**
AVE	**.55**	**.57**	**.74**

Note: AVE= Average variance extracted

DISCUSSION

The current study, which was conducted to investigate the behaviors of children with ASD playing table tennis with the parent report and to evaluate the perceptions of their children about playing table tennis, would contribute to leisure literature.

In the exploratory factor analysis, it was determined that the 12-item-3 sub-dimension structure can be evaluated as 11-item and 3-factor structure, since one item expresses an overlapping value. In the confirmatory factor analysis tested to procure evidence for the scale's the factor structure, it was determined that the structure was confirmed. Fit values such as $\chi 2/df$= 2.05, p<.00; RMR= .06; SRMR= .09; CFI= .95; GFI= .88; NFI= .91; TLI= .93; RMSEA= .09were used in the evaluation of the factor structure and these model fit values obtained were within acceptable limits (Hooper et al., 2008, Meydan &Sesen, 2015; Tabachnick&Fidell, 2006).

When statistics literature has been examined, value (≥.05) of RMSEA and SRMR were accepted as a perfect fit, values (<.10) as an acceptable fit; values (>.10) as a bad fit. As for other fit criteria, it could be interpreted as the model fits better if the value was between 0 and 1 and close to 1 (Byrne, 1998; Jöreskog&Sörbom, 2002; Yilmaz & Ilhan Dalbudak, 2018). However, there have been different opinions on $\chi 2/df$, especially researchers have made different evaluations on this issue in statistics literature. For example, Hu and Bentler (1999) stated that the $\chi 2/df$ was very sensitive to the number of samples and stated that the increase in the sample number may cause the $\chi 2/df$ to increase and the research models to be rejected. However, Hooper et al. (2008) expressed that there was no consensus in which value ranges are acceptable for this statistical result, so there are researchers who accept $\chi 2/df$value up to 2.0 (Tabachnick&Fidell, 2006) as well as those who accept it up to 5.0 (Wheaton at al., 1977).

The results of our study parallel those of other research in different cultures on the leisure involvement scale. For example, Vlachopoulos et al. (2008) tested MIS's the factor structure on 260 Greeks aged 15-71. In the study, it was determined that five-factor MIS was not clearly supported for this sample group, only three factors could be used as a valid and reliable measurement tool for this sample.Huang et al. (2013) determined the scale as a three-factor structure in a study conducted with 249 Taiwan citizens. Similarly, Hickerson et al. (2014) analyzed the three-factor structure adapted from MIS in order to evaluate the behaviors of children with ASD towards video game through the parents and determined that the measurement tool gave valid and reliable results. However, there were also studies in the literature indicating that the five-factor structure of MIS could be used as a reliable measurement tool without loss of item or sub-dimension. For example, Gurbuz et al. (2018) determined that the Turkish validity and reliability study of the Turkish validity and reliability study, which was carried out to measure the involvement levels of 309 Turkish individuals participating in fitness programs as a leisure activity, could be used for Turkish culture as well.

Based on the average scores at the factor level, involvement of a child with ASD towards

table tennis activity is quite intense. This situation can be interpreted as the fact that the activity is in the center of the life of the individual, and it is also effective at the level of social bonding. In addition to this Interest Intensity and social bonding effect created through the activity, it also generates information on the extent to which table tennis determines the child's self-expression process with ASD. When the average values of PRIS were examined, it was observed that it had the lowest score in the dimension of self-expression. With the table tennis activity, a child with ASD values the activity at a high level, can socialize because of the activity, but the activity may be inadequate in using it as a means of self-expression. Karakas et al. (2016) concluded in a study in which physical activities were carried out to evaluate the social skill levels and behaviors of children with ASD aged 5-6 that as the duration of the activity increases, children's social and behavioral skills improve.

Communication of children with ASD with their peers and their environment is limited. This is because they encounter some obstacles in establishing social bonds with their environment, or they are insensitive to their environment (Shattuck et al., 2011). However, in studies conducted, researchers found that children with ASD started to display socialization-oriented behaviors such as communicating with their environment and playing games together, especially with activity-based education programs (Ingersoll, 2009; Koegel et al., 2012). Children with ASD's another problem about socialization is their repetitive behaviors and their interest and focus on only one thing. However, having a limited interest in any subject was known to has a negative effect on the socialization levels of children with ASD (APA, 2000; White-Kress, 2003).

Gal et al. (2009) defined these interests as individuals with ASD's preoccupations or interests which become unusual in their focus and/or intensity and called these interests as circumscribed interests (CI). According to the definition above, Activities with high interest intensity scores in PRIS can be considered as CI for children with ASD. It is seen that the intensity of these interests increases throughout the life of the individual, and this can hinder the development of peer relationships because the individual is only occupied with her own interests. Traditionally, interventionists have focused on reducing interaction by CI to increase social interaction with other people. However, research (Boyd et al., 2006; Gal et al., 2009) has reported that a CI can only be socially isolated when it doesn't match mainstream hobbiesor interests. A child's CI can be a powerful context or tool for developing appropriate behavior or social skills (i.e., Attwood, 2003) when considered as an opportunity to target new skills using motivation to encourage involvement.

Conclusion

This study has revealed the Turkish validity and reliability of PRIS which is a parent-reported scale for testing children with ASD's involvement in leisure. The results demonstrated that the Turkish version of the scale has composed of 11 items and 3 factors (interest intensity, social bounding, self-expression) while original one has consisted of 12 items and 3 factors. It has been thought that the Turkish form of scale could be used as a valid and reliable measurement tool to determine the involvement levels of Turkish children with ASD towards both table tennis, and the levels of their involvement in other physical activities. On the other hand, it has been thought that this measurement tool would contribute to various fields of study such as Therapeutic Recreation Expertise, even if indirectly.This situation has revealed that different studying groups could also help about developing the obtained scale structure.

Limitation and future research

The fact that only the interest intensity, self-expression and social bonding dimensions of the leisure involvement scale used in the study were evaluated within the scope of the study have proved that the involvement in table tennis activity was limited in these dimensions and examined in the study. In addition, determination of the study group according to certain criteria such as “thechild with ASD is between the ages of 5 and 18”, “they have been involved in table tennis activity for a year or more” and “participate in thisactivityat least two days a week”haveconstituted the limitation of the study regarding the sample.For this reason, the findings obtained from this study cannot be directly generalized with other research findings obtained from children with ASD who participate in various activities (i.e., physical) apart from table tennis, but it is thought that the scale can be used by conducting a pilot study to measure the level of

individuals' involvement who participate in other physical activity programs.

To better evaluate the sport clubs that offer recreational activities to children with ASD as a preventive health service, it can be done with different studies that include the opinions of families on the subject in a more comprehensive way. This situation will contribute to the researchers in understanding the subject more deeply. It can be said that such research results will also guide business managers who provide such recreational services in creating customer profiles of parents with children with ASD and effectively presenting their services to families. At the same time, it is thought that future studies that include different types of activities and focus on sample groups of other disabled individuals will contribute to filling an important gap in the leisure literature.

Conflict of interest

Theauthorsdeclarenoconflicts of interest. No financialsupport has beenreceived.

Ethics Committee

The study was confirmed by Bartın University Social and Human Sciences Ethics Committee which is a recognized review board or ethics committee on February 09, 2023 (Approval no:2023-SBB-0051).

Author Contributions

Study Design, İA; Data Collection, İA; Statistical Analysis, İA; DataInterpretation, İA; ManuscriptPreparation, İA, İB; LiteratureSearch, İA, İB. Thepublishedversion of themanuscript has beenreadandapprovedbyallauthors.

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

RESEARCH ARTICLE

Relationship of Obsessive Compulsive Disorder with Social Anxiety and Psychological Resilience in Adults

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Abstract
Objective: Obsessive-compulsive disorder (OCD) is a mental illness characterized by permanent obsessions and compulsions that cause severe distress and disrupting one's functionality. The obsession is defined as a pattern of intortion, intortion and improper thought, idea, imagination and impulses. In this context, the aim of the study is to determine the relationship of obsessive compulsive disorder in adults with social anxiety and psychological durability. The group of this study was composed of individuals who were treated or still seeing in the hospitals and private psychological counseling center in İzmir region in 2022-2023. **Method:** The sample of the study was composed of 400 participants who have been diagnosed with obsessive compulsive age of 18 years and more selected by the purposeful sampling method. Maudsley Obsessive Compulsive Question list to collect data in the study, Liebowitz was used as a scale of social anxiety and short psychological stability. **Results:** In the finding of the research, it is moderately positive ($p<0.05$); Slowness, doubt, strong level between ruminating levels at strong level ($p<0,01$ *$p<0,05$); Maudsley is very strongly positive between obsessive compulsive levels($p<0.05$); weak levels of anxiety, avoidance and social anxiety levels ($p<0,17$, $p<0,11$); The levels of psychological strength were found to be weakly negative and significant relations between the levels. **Conclusion:** obsessions and compulsions were significant in the results of the research results in the results of the tested variables. However, there were no significant results in the anticipated psychological endurance level. Therefore, the relationship between obsessive-compulsive scores and another variable may be examined.

Keywords
Obsessive, Compulsive, Social Anxiety, Psychological Durability

INTRODUCTION

Obsessive-compulsive disorder (OCD) is a mental illness characterized by persistent obsessions and compulsions that cause severe distress and impair one's ability to function (Derin, Yorulmaz, 2020). An obsession is defined as a pattern of intrusive and inappropriate thoughts, ideas, dreams and impulses that cause stress (Abay et al., 2010). Compulsion is defined as the repetition of behaviors, ideas or actions to relieve stress or anxiety caused by obsessions (Abay et al.,2010).Obsessions and compulsions may be found in people without a psychiatric diagnosis, as in people with obsessive-compulsive disorder (OCD) (Ohayan et al., 2010). According to studies conducted in high-income countries, OCD has been associated with the high prevalence of psychiatric disorders, particularly anxiety and mood disorders. Considering this important

Received: 01 March.2023 ;**Accepted:03** June 2023; **OnlinePublished:** 11 June 2023
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How to cite this article: Çalıkkasap, B., Karaaziz, M. and İskender, C. (2023). Relationship of Obsessive Compulsive Disorder with Social Anxiety and Psychological Resilience in Adults**.** *Int J Disabil Sports Health Sci*;2023;6(2):238-250..https://doi.org/10.33438/ijdshs.1258313

relationship, it is quite reasonable to consider the link between OCD and anxiety.Some studies have reported that anxiety is an important factor in many psychiatric disorders (Silverstone., 2010).

The fact that anxiety is one of the most basic emotions necessary for survival shows that it is closely related to psychology. The fact that anxiety exists in human nature and negatively affects the functionality of the person as a result of the deterioration of risk perception has caused it to be associated with psychological disorders and to be the subject of many studies in the field of psychology. Anxiety has been associated with various psychological and physical problems as a result of being treated in a psychopathological framework, especially in the therapeutic field (Aydemir et al., 2000; Huang., 2016). The fact that some people experience the same negative life experiences and develop pathological symptoms while others continue to function without developing symptoms suggests that there are mediating factors in pathological anxiety. In this study, while individual differences are examined on the basis of psychological resilience, in general, individual differences are discussed on the basis of the pathological course of anxiety (Lewis., 2012). Creativity, reasoning, decision making, problem solving and the ability to adapt to a variety of purposeful activities such as constantly changing conditions and environments are defines as cognitive control and cognitive flexibility (Dajani et al., 2015; Gabrys et al., 2018). Research also shows that as well as both cognitive control and cognitive flexibility, sensitivity to uncertainty is linked to obsessive-compulsive symptoms and generalized anxiety symptoms (Chamberlain et al., 2006).

Individuals may encounter numerous stressful and challenging events throughout their lives. In these periods, people shape their lives in the context of various reactions. While some people adapt to changing conditions and continue to live their lives, some face numerous adaptation problems and can never recover. In positive psychology, psychological resilience is defined as an individual's ability to get out of troubles and continue their normal life (Hallion et al., 2010). "What is psychological resilience and what does resilience behaviors include?" is a question that has come to the fore in recent years regarding the concept of psychological resilience emphasized by positive psychology. This fundamental question emerges as a complex of psychological and behavioral processes (Agaibi et al., 2005). Resilience is defined as the process of adaptation and development in the face of great dangers (Masten et al., 2001; Fletcher., 2013). Another meaning is the steady and rapid recovery and even improvement of the individual in the face of significant adverse conditions (Leipold., 2009). Being psychologically resilient is seen as a ability to cope as well as being a character and personality trait (Aaibi et al.,2005).

It is clear that the models presented in the literature to explain resilience are becoming more and more environmentally focused. Resilience is accepted as a versatile and dynamic structure that includes mutual interaction between individuals and their environment in various contexts (family, friends, school, community, organization, etc.) (Masten et al., 2001). The developmental approach is another key technique used to study resilience. According to Rutter (1987), individuals are particularly vulnerable during crises, which can be developmental or situational turning points, and he emphasizes the importance of showing resilience at such moments (Fletcher., 2013). Considered in terms of the two ways mentioned; Considering the period and conditions of university students who are faced with new situations such as the city, lifestyle, social environment, self-sufficiency, and academic expectations, the importance of psychological resilience and social anxiety levels in coping with these processes becomes apparent (Leipold et al., 2009). Contagion, suspicion, symmetry, religious inclination or excessive sexual preoccupation are examples of obsessions in individuals. The most basic belief in people with obsessions is the thought that terrible things will happen if they cannot perform the ritual-style movements that they have designed for themselves (Basım et al., 2011). Hand washing, excessive cleaning, checking without interruption, repeating certain movements that the person has discovered, counting, putting everything in order, and stacking everything are examples of compulsions (Swedo et al.,2006).Anxiety is the worry and distress that comes with the risk and possibility of injury, as well as the fear that something terrible will happen (Budak., 2005).

Obsessive compulsive disorder (OCD) is a common disease that causes dysfunction in humans through different clinical images and obsessive themes that emerge (Doron et al., 2014).

Obsessive-compulsive symptoms in romantic relationships are one of the new research topics that have begun to be emphasized in recent years (Tekbıyık et al., 2014). It is expected that investigating the relationship between ruminative thinking style, body image and social appearance anxiety, and romantic relationship and partner-themed obsessive-compulsive symptoms will lead to a better understanding of this symptom profile.

Tumlu (2014) defines resilience as a quality that enables a person to persevere in the face of difficulties. For this reason, the problem statement of the research is formed as "Is there a relationship between OCD and social anxiety and psychological resilience?"In this study, determining whether the level of obsession changes according to social anxiety and psychological resilience in adults is aimed. The main purpose of the study is to determine the relationship between obsessive compulsive disorder, and social anxiety and psychological resilience in adults and to find answers to the questions below.

1. Do social anxiety and psychological resilience levels of obsessive-compulsive disorder differ according to gender, age, education, marital status?
2. Is there a significant relationship between obsessive compulsive disorder, and social anxiety and resilience levels?
3. Do social anxiety and resilience predict levels of obsessive compulsive disorder?

The importance of the research is that anxiety, psychological resilience, coping ways and metacognition variables that are thought to be related to each other are discussed together. In the literature, it is seen that the variables are handled in different ways, but not as a whole. In this respect, it is thought that understanding the mediating role of metacognition, as well as the levels of explaining the anxiety together of variables and their relations with each other, are important in terms of contributing to the literature.

MATERIALS AND METHODS

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Model of the Research

In the study, the relational screening model was used for the relationship between obsessive-compulsive disorder, and social anxiety and resilience in adults. Relational studies allow for estimation of outcomes and interpretation of variable relationships. In these studies, the researcher focuses on the existence of the relationship between the variables and the strength of this relationship. Although statistical comparisons are made in relational survey studies, the researcher has no influence or control over the variables (Ohayon et al., 2010).

Universe and Sample

The group of this study was composed of individuals who received or are still receiving treatment in hospitals and private psychological counseling centers in Izmir region in 2022-2023. The sample of the study was composed of 400 participants aged 18 and over who were diagnosed with obsessive-compulsive, selected by purposive sampling method. Purposive sampling is a non-probability sampling method. The researcher tries to understand natural and social events or phenomena in the context of certain situations, and to examine and explain the relationships between them (Swedo, 2006).

Information About Participants

It is seen that 66.8% of the participants are female and 33.2% are male. The rate of the participants in the 18-26 age range is 22.8%, the rate of the participants in the 27-35 age range is 20%, and the rate of the participants in the age range of 36 and over is 57.3%. Considering the educational background of the participants, it is seen that primary school is 2.5%, high school is 8%, associate degree is 10%, undergraduate is 68.8% and others are 10.8%. It is understood that the highest rate in terms of income status belongs to middle income status with 86.3%, low income status has 7.8% and high income status has 6%. 66.3% of the participants are married, 29.8% are single and 4% are widowed/divorced. While the rate of participants who have any physical disability is 2.5%, the rate of those who do not is 97.5%. The rate of participants who have a person in their family who receives treatment for psychological problems is 22.3%, and the rate of participants who do not have a person in their family who receives psychological treatment for psychological problems is 77.8%.

Data Collection Tools

Information Form, Socio-Demographic Information Form, Maudsley Obsessive Compulsive Question List, Liebowitz Social Anxiety Scale and Brief Psychological

ResilienceScale were used as data collection tools for the research.

Personal Information Form

Socio-demographic information form created by the researcher consists of gender, age, educational status, income status, marital status and questions such as "Do you have any physical disability?" and "Is there any treatment in your family due to psychological problems?".

Maudsley Obsessive Compulsive Question List

It is an assessment material designed to determine the presence of obsessive-compulsive symptoms in humans, and what kind and to what extent, if any. The original version of this scale, created by Hodgson and Rachman in 1977, consists of 30 components. For the entire scale, Cronbach's alpha coefficient was calculated as 0.88; it was calculated as 0.78 for the control subscale, 0.84 for cleaning, 0.66 for suspicion and 0.59 for slowness. As a result of the examinations conducted by Erol and Savaşır (1988) to this scale, a total of 7 different items were added to MMPI and the total number of items in Turkish form reached 37. The scale consists of right and wrong options, 1 point for each correctly answered item, 0 points for each question answered incorrectly. The highest score of the scale is 37. It includes control, cleanliness, slowness, doubt and rumination subscales which were added later to the Turkish form. The control subscale consists of items 2, 6, 8, 14, 15, 20, 22, 26 and 28; the cleaning subscale consists of items 1, 4, 5, 9, 13, 17, 19, 21, 24, 26 and 27; the slowness subscale consists of items 2, 4, 8, 16, 23, 25 and 29; doubt sub-scale consists of items 3, 7, 10, 11, 12, 18 and 30; and the rumination subscale consists of items 2, 8, 31 and 37. In Turkish reliability studies, Cronbach's Alpha coefficient was determined as 0.86 for the entire scale and it was determined as 0.61-0.65 for subscales. It was found that r=0.59-0.84 for the entire scale in the test-retest reliability studies. The construct validity of the scale was determined by using factor analysis and three factors were discovered. Cleaning and meticulousness are the first, obsessive thinking is the second, slowness and control are the third factor (24).

Liebowitz Social Anxiety Scale

The scale developed by Liebowitz (1987) consists of 24 items designed to examine social scenarios in which people with social anxiety may experience difficulties. Each item in the scale is graded in terms of "fear or anxiety" and "avoidance behavior". Items are rated on a scale from "not at all" (0) to "severe" (3). The Cronbach's alpha coefficient for the entire scale was found to be 0.96. Cronbach alpha scores of both fear/anxiety and avoidance subscales are 0.92. (Heimberg et al., 1999). Soykan et al. (2003) created the Turkish version of the scale. The test-retest reliability coefficient of the scale was found to be r=.97. The Cronbach Alpha Value of the social anxiety subscale is .96, and the Cronbach Alpha Value of the social avoidance subscale is .95. The Cronbach Alpha value of the whole scale is .98. The Cronbach Alpha value of the scale ranges from .92 to .81. Discriminant validity in validity studies is .26; when Beck Anxiety Inventory was used as a criterion, criterion validity was determined as r=.21.

The Brief Resilience Scale

Smith et al. (2008) developed the scale to assess people's psychological resilience. The Brief Resilience Scale is a 6-item, 5-point Likert-type assessment tool that allows individuals to evaluate themselves. The scale has only one dimension. The highest score that can be obtained from the scale is 30, and the lowest score is 6. The internal consistency approach was used to evaluate the reliability of the BRS and the internal consistency coefficient was found to be .83. The Turkish adaptation of the short form of the scale was carried out by Doğan (2015). Items 2, 4 and 6 of the scale were reverse coded. High scores obtained after these items were translated indicate a high level of psychological resilience. The factor loads of the scale items were found to vary between .68 and .91. Internal consistency and test-retest methodologies were used to determine the reliability of the scale. As a result, it was discovered that the internal consistency reliability coefficient ranged between .80 and .91 whereas the test-retest reliability coefficient was found to be between .62 and .69.

Data Collection Process

Ethical permission was obtained from the Near East University Scientific Research Ethics Committee before the data were collected for this study. Information and informed consent forms were given to the participants beforehand. In the information and informed consent form, the content of the research and the information that the answers will remain anonymous were given. An online survey system was applied to collect data on a voluntary basis. Links containing the data of the

study (whatsapp, mail, telegram, facebook, etc.) were shared on social media platforms. Answering the questionnaire took an average of 10-15 minutes.

Study Plan and Process

In January 2022, permission was obtained from the researchers who developed or adapted the Maudsley Obsessive Compulsive Question List, Liebowitz Social Anxiety Scale and the Brief Resilience Scale in the first phase of the study. In the second stage, between January 2022 and March 2022, the Near East University Ethics Committee was applied to, and the Ethics Committee's permission was obtained and the research was started.

Since the pandemic process continued at the start of the research in March 2022, the scales and personal information form, participant information and participant consent forms were prepared online with Google Form. In March 2022, conceptual foundations and related research were examined, and the scales were delivered online to 400 volunteers aged 18 and over, who were determined by the appropriate sampling method for the research, and data were collected. The findings obtained as a result of the statistical analyzes made with the data obtained from the sample group between April 2022 and May 2022 were discussed in line with the literature, and conclusions and suggestions were made.

Data Analysis

In order to determine the distribution of Maudsley obsessive-compulsive, social anxiety and resilience scores, the skewness kurtosis coefficients were used. The skewness and kurtosis coefficients between +1 and -1 indicate that the scores have a normal distribution (Büyüköztürk., 2012).

Independent sample t-test was used to compare Maudsley obsessive-compulsive, social anxiety and resilience scores according to two-category variables while one-way analysis of variance was used to compare according to variables with more than two categories. Scheffe multiple comparison test was used to determine the source of the difference in the analysis of variance. Pearson correlation coefficients were calculated so as to examine the relationships between Maudsley obsessive-compulsive, social anxiety and resilience scores. Simple linear regression analyzes were performed to determine the effect on Maudsley obsessive compulsive, social anxiety and psychological resilience. Analyzes were carried out using the SPSS 22.0 statistical package program.

RESULTS

When Table 1 is examined, it is understood that the mean scores of controlling, anxiety, avoidance and social anxiety of the participants do not show a significant difference according to their gender status ($p>0.05$). In addition, it is seen that the mean scores of men and women in these dimensions are similar. It is understood that the mean scores of cleanliness, slowness, doubt, rumination, maudsley obsessive-compulsive and psychological resilience show a significant difference according to the gender status of the participants ($p<0,05$). However, while the mean scores of cleanliness, slowness, doubt, rumination and maudsley obsessive-copulsive scale are the highest in women, it is seen that the mean score of the psychological resilience scale is the highest in men.

When Table 2 is examined, it is understood that the mean scores of cleanliness, avoidance and social anxiety do not differ significantly according to the age of the participants ($p>0.05$). However, it is seen that the mean scores of the 18-26, 27-35, 36 and above age ranges are similar in these dimensions. It is understood that the mean scores of controlling, slowness, doubt, rumination, maudsley obsessive-compulsive, anxiety and psychological resilience show a significant difference according to the age of the participants ($p<0.05$). Moreover, it is seen that in the 18-26 age group, the mean scores of controlling, slowness, doubt, rumination and maudsley obsessive-compulsive are the highest whereas the average score of anxiety in the age range of 27-35 and the mean score of psychological resilience in the age group of 36 and above are the highest.

When Table 3 is examined, it is understood that the mean scores of anxiety, avoidance, social anxiety and psychological resilience do not differ significantly according to the educational level of the participants ($p>0.05$). Furthermore, it is seen that the mean scores of primary school, high school, undergraduate and others in these dimensions are similar. It is also understood that the mean scores of controlling, cleanliness, slowness, doubt, rumination and maudsley obsessive compulsive differ according to the education level of the participants ($p<0.05$).

However, it is seen that the highest average score in these dimensions belongs to high school education

Table 1. Comparison of maudsley obsessive compulsive, social anxiety and resilience scale scores by gender of participants

Variables	Gender	N	Avg.	Ss.	t	p
Controlling	Female	267	2,51	2,18	1,40	0,16
	Male	133	2,20	1,98		
Cleanliness	Female	267	4,02	2,17	3,28	0,00*
	Male	133	3,26	2,18		
Slowness	Female	267	1,87	1,43	1,90	0,05*
	Male	133	1,59	1,31		
Doubt	Female	267	3,34	1,54	2,05	0,04*
	Male	133	3,00	1,59		
Rumination	Female	267	1,58	1,37	1,99	0,04*
	Male	133	1,29	1,37		
Maudsley Obsessive Compulsive	Female	267	12,50	6,03	3,07	0,00*
	Male	133	10,51	6,17		
Anxiety	Female	267	25,36	15,99	0,76	0,44
	Male	133	24,05	16,63		
Avoidance	Female	267	24,80	16,30	0,29	0,76
	Male	133	24,28	17,18		
Social Anxiety	Female	267	50,15	30,19	0,56	0,57
	Male	133	48,32	30,63		
Psychological Resillience	Female	267	18,61	4,96	-2,93	0,00*
	Male	133	20,16	4,95		

p<0,05

Table 2. Comparison of maudsley obsessive compulsive, social anxiety and resilience scale scores by age of participants

Variables	Age	N	Avg.	Ss.	F	P
Controlling	18-26	91	3,33	2,10	14,20	0,00*
	27-35	80	2,56	2,24		
	36 and above	229	1,99	1,96		
Cleanliness	18-26	91	4,02	2,43	0,77	0,46
	27-35	80	3,69	2,12		
	36 and above	229	3,7,0	2,13		
Slowness	18-26	91	2,25	1,55	8,29	0,00*
	27-35	80	1,84	1,39		
	36 and above	229	1,56	1,29		
Doubt	18-26	91	3,80	1,54	8,49	0,00*
	27-35	80	3,18	1,62		
	36 and above	229	3,02	1,51		
Rumination	18-26	91	1,91	1,46	8,57	0,00*
	27-35	80	1,65	1,44		
	36 and above	229	1,25	1,27		
Maudsley ObsessiveCompulsive	18-26	91	14,52	6,64	12,85	0,00*
	27-35	80	11,86	5,91		
	36 and above	229	10,76	5,70		
Anxiety	18-26	91	26,53	16,16	3,21	0,04*
	27-35	80	28,0	18,29		
	36 and above	229	23,21	15,25		
Avoidance	18-26	91	24,60	15,29	0,35	0,70
	27-35	80	25,98	18,20		
	36 and above	229	24,16	16,53		
SocialAnxiety	18-26	91	51,13	29,76	1,57	0,20
	27-35	80	53,98	34,14		
	36 and above	229	47,37	29,01		
Psychological Resilience	18-26	91	17,95	5,49	3,34	0,03*
	27-35	80	19,34	4,99		
	36 and above	229	19,52	4,75		

p<0,05

Table 3. Comparison of maudsley obsessive compulsive, social anxiety and resilience scale scores by educational level of participants

Variables	Educational background	N	Avg.	Ss.	F	P
Controlling	Primary school	10	2,00	2,16	5,67	0,0*
	High school	32	3,50	2,41		
	Associate degree	40	3,43	2,25		
	Undergraduate	275	2,17	1,97		
	Others	43	2,23	2,24		
Cleanliness	Primary school	10	3,50	1,26	5,54	0,00*
	High school	32	5,41	2,32		
	Associate degree	40	4,03	2,28		
	Undergraduate	275	3,62	2,10		
	Others	43	3,35	2,37		
Slowness	Primary school	10	1,1	1,19	8,36	0,00*
	High school	32	2,78	1,56		
	Associate degree	40	2,38	1,49		
	Undergraduate	275	1,65	1,29		
	Others	43	1,42	1,43		
Doubt	Primary school	10	3,1	1,52	6,27	0,00*
	High school	32	4,09	1,71		
	Associate degree	40	3,98	1,34		
	Undergraduate	275	3,08	1,48		
	Others	43	2,84	1,81		
Rumination	Primary school	10	1,2	1,22	4,69	0,00*
	High school	32	2,22	1,38		
	Associate degree	40	2	1,46		
	Undergraduate	275	1,35	1,34		
	Others	43	1,33	1,30		
Maudsley ObsessiveCompulsive	Primary school	10	10,8	4,49	8,25	0,00*
	High school	32	16,22	6,92		
	Associate degree	40	14,78	6,17		
	Undergraduate	275	11,06	5,61		
	Others	43	11,05	7,08		
Anxiety	Primary school	10	25,3	16,80	1,81	0,12
	High school	32	31,38	14,36		
	Associate degree	40	26,68	16,07		
	Undergraduate	275	24,33	16,52		
	Others	43	22,14	14,62		
Avoidance	Primary school	10	25,2	13,38	1,58	0,17
	High school	32	31,63	16,41		
	Associate degree	40	24,5	15,04		
	Undergraduate	275	23,94	16,98		
	Others	43	23,77	15,56		
SocialAnxiety	Primary school	10	50,5	26,84	1,90	0,11
	High school	32	63	30,09		
	Associate degree	40	51,18	30,29		
	Undergraduate	275	48,28	30,49		
	Others	43	45,91	28,71		
Psychological Resilience	Primary school	10	19,4	3,27	1,52	0,19
	High school	32	18,16	3,94		
	Associate degree	40	17,58	5,62		
	Undergraduate	275	19,42	5,21		
	Others	43	19,35	3,81		

p<0,05

When Table 4 is examined, it is understood that the mean scores of cleanliness, slowness, doubt, anxiety, avoidance, social anxiety and psychological resilience do not show a significant difference according to the marital status of the participants (p>0.05). However, it is seen that single, married and widowed/divorced mean scores are similar in these dimensions. It is also understood that the mean scores of controlling, rumination and maudsley obsessive compulsive according to the marital status of the participants show a significant difference (p<0.05). However, it is seen that the highest average scores in these dimensions belong to single participants.

When Table 5 is examined, it is understood that there is a moderately positive relationship between the participants' checking and cleaning (r=0.451; p<0.01) scores; a positive relationship between the scores of slowness (r=0,680; p<0,01), doubt (r=0,605; p<0,01) and rumination (r=0,696; p<0,01); a very strongly positive relationship between the scores of maudsley obsessive compulsive (r=0,840; p<0,01); a weakly positive relationship between anxiety (r=0,266; p<0,01), avoidance (r=0,231, p<001) and social anxiety (r=0,269; p<0,01); a weakly negative and significant relationship between the scores of psychological resilience (r=-0,324; p<0,01). As controlling scores increase, cleanliness, slowness, doubt, rumination, maudsley obsessive compulsive, anxiety, avoidance and social anxiety scores increase; psychological resilience scores decrease.

Table 4. Comparison of maudsley obsessive compulsive, social anxiety and resilience scale scores by marital status of the participants

Variables	Medeni Durumu	N	Avg.	SS.	F	P
Controlling	Single	119	3,09	2,163	9,276	0,00*
	Married	265	2,11	2,033		
	Widow/Divorced	16	2,31	2,182		
Cleanliness	Single	119	3,56	2,272	2,919	0,055
	Married	265	3,92	2,169		
	Widow/Divorced	16	2,75	1,949		
Slowness	Single	119	2,02	1,455	2,728	0,067
	Married	265	1,66	1,375		
	Widow/Divorced	16	1,88	1,204		
Doubt	Single	119	3,51	1,501	2,839	0,06
	Married	265	3,1	1,593		
	Widow/Divorced	16	3,19	1,515		
Rumination	Single	119	1,74	1,47	3,314	0,037
	Married	265	1,35	1,312		
	Widow/Divorced	16	1,63	1,628		
Maudsley ObsessiveCompulsive	Single	119	13,13	6,427	3,836	0,022
	Married	265	11,3	5,905		
	Widow/Divorced	16	11,06	6,884		
Anxiety	Single	119	26,18	17,03	0,638	0,529
	Married	265	24,5	15,721		
	Widow/Divorced	16	22,44	18,048		
Avoidance	Single	119	23,2	15,83	1,41	0,245
	Married	265	25,53	16,798		
	Widow/Divorced	16	20,19	18,101		
SocialAnxiety	Single	119	49,39	30,949	0,452	0,637
	Married	265	50,03	29,888		
	Widow/Divorced	16	42,63	33,629		
Psychological Resilience	Single	119	18,44	5,358	1,661	0,191
	Married	265	19,44	4,82		
	Widow/Divorced	16	19	5,241		

p<0,05

Table 5. Pearson correlation coefficients of the relationships between the participants' maudsley obsessive compulsive, social anxiety, and resilience scores

Variables		1	2	3	4	5	6	7	8	9	10
Controlling	r	1									
	p										
	N	400									
Cleanliness	r	,451**	1								
	p	0									
	N	400	400								
Slowness	r	,680**	,502**	1							
	p	0	0								
	N	400	400	400							
Doubt	r	,605**	,463**	,500**	1						
	p	0	0	0							
	N	400	400	400	400						
Rumination	r	,696**	,385**	,751**	,472**	1					
	p	0	0	0	0						
	N	400	400	400	400	400					
Maudsley ObsessiveCompulsive	r	,840**	,750**	,715**	,802**	,679**	1				
	p	0	0	0	0	0					
	N	400	400	400	400	400	400				
Anxiety	r	,266**	,121*	,190**	,192**	,303**	,249**	1			
	p	0	0,015	0	0	0	0				
	N	400	400	400	400	400	400	400			
Avoidance	r	,231**	,126*	,162**	,216**	,225**	,233**	,710**	1		
	p	0	0,012	0,001	0	0	0	0			
	N	400	400	400	400	400	400	400	400		
SocialAnxiety	r	,269**	,134**	,190**	,221**	,285**	,261**	,923**	,927**	1	
	p	0	0,007	0	0	0	0	0	0		
	N	400	400	400	400	400	400	400	400	400	
Psychological Resilience	r	-,324**	-,231**	-,309**	-,243**	-,485**	-,350**	-,322**	-,268**	-,319**	1
	p	0	0	0	0	0	0	0	0	0	
	N	400	400	400	400	400	400	400	400	400	400

**p<0,01 *p<0,05

When Table 6 is examined, it is understood that the psychological resilience (β=-0.29; p<0.05) levels of the participants negatively predict Maudsley obsessive-compulsive disorder. However, anxiety (β=0.08; p>0.05) and avoidance (β=0.09; p>0.05) levels do not seem to predict Maudsley obsessive-compulsive disorder. Social anxiety and resilience explain 38% of the change in Maudsley obsessive-compulsive disorder among participants.

Table 6. Regression analysis results of the effect of social anxiety and resilience on maudsley obsessive compulsive disorder in participants

Variables	B	SH	B	T	P
(Sabit)	17,12	1,42		12,05	0,00*
Anxiety	0,03	0,02	0,08	1,33	0,18
Avoidance	0,03	0,02	0,09	1,36	0,17
Psychological Resilience	-0,36	0,06	-0,29	-6,04	0,00*
R=0,38	R2=0,14	F(3;399)=22,750		p<0,05	

DependentVariables=Maudsley ObsessiveCompulsive

DISCUSSION

The main purpose of the research is to examine the relationship between obsessive compulsive disorder, and social anxiety and resilience in adults. In this context, the variables will be compared in terms of gender, age, educational status and marital status. In this section, the findings will be discussed in the light of the literature.

In the study, it was determined that the levels of controlling, anxiety, avoidance and social anxiety do not change according to gender. It is seen that the levels of men and women are similar in these dimensions. However, it was determined that the levels of cleanliness, slowness, doubt, rumination, maudsley obsessive-compulsive and psychological resilience change according to the gender of the participants. It was observed that cleanliness, slowness, doubt, rumination and maudsley obsessive compulsive levels are the highest in women while the levels of psychological resilience are the highest in men. When the studies in the literature are examined, Lochner et al. (2004), Akgun et al. (2009), Mathis et al. (2011) and Cherian et al. (2014) found in their study that women are more concerned with regards to gender. When the studies on obsessive beliefs were examined, it was determined that there is a difference in the results obtained according to gender. In a study conducted by Ercan (2015), it was stated that the obsessive belief levels are higher in male participants, contrary to the results of this study. However, the study conducted by Demet et al. (2005) and Karaali and Aktaş (2014) showed that women have higher obsessive beliefs than men. When the studies on obsessive and compulsive beliefs in terms of gender are evaluated as a whole, it can be thought that the study enriches the literature with the findings in favor of female participants. In the other finding of the study, it was determined that the levels of cleanliness, avoidance and social anxiety donnot change according to the age of the participants. When the literature is examined, Tokuç et al. (2009) and Çoban (2013) found in their study that social anxiety do not differ according to the age variable. Significant changes were found in the levels of controlling, slowness, doubt, rumination, maudsley obsessive-compulsive, anxiety and psychological resilience according to the age of the participants. However, it was found that controlling, slowness, doubt, rumination and maudsley obsessive-compulsive levels are highest in the 18-26 age group, and that the anxiety levels in the 27-35 age range and the psychological resilience levels in the 36 and over age range are highest. Many studies in the literature have investigated whether there is a link between resilience and other characteristics in different age groups. In the studies conducted by Arısoy (2019) and Eser (2019), it was stated that OCD beliefs differ according to the age group. This finding is important in that it is similar to the results of the study.

It was determined that the levels of anxiety, avoidance, social anxiety and psychological resilience do not change according to the education level of the participants. It was determined that the levels of controlling, cleanliness, slowness, doubt, rumination and maudsley obsessive compulsive change according to the other sub-dimensions of educational status. It was observed that the highest levels in these dimensions belonged to high school education. It is possible that an individual's OCD beliefs are affected by many factors from childhood to adulthood. Therefore, the differentiation of OCD beliefs in the educational process is an expected result in the context of research. This result is also supported by studies by Ercan (2015) and Cevheri (2018). Similar to this study, in Ercan's (2015) study, it was determined that OCD beliefs are affected by the educational status variable. However, Gençay (2009), Özmen et al. (2008), Karaali (2014) and Arısoy (2019) found no relationship between educational status, and anxiety and obsessive beliefs.

In the study, it was determined that the levels of cleanliness, slowness, doubt, anxiety, avoidance, social anxiety and psychological resilience do not change according to marital status. In addition, it was determined that controlling, rumination and maudsley obsessive compulsive levels change according to the marital status of the participants. It was observed that the highest levels of these dimensions belonged to single participants. When the studies in the literature were examined, studies showing parallelism with the findings were observed (25). When the studies on OCD were examined, it was concluded that the marital status variable had been examined in very few studies. The limited number of studies on OCD and marital status supporting

this research is of critical importance in terms of the literature. Studies by Pusuroğlu (2016) and Arısoy (2019) stated that obsessive beliefs do not differ according to marital status.

In the significant finding of the study, it was determined that there is a moderately positive relationship between the participants' checking and cleaning scores; a positive relationship between the scores of slowness, doubt and rumination; a very strongly positive relationship between the scores of maudsley obsessive compulsive; a weakly positive relationship between anxiety, avoidance and social anxiety; a weakly negative and significant relationship between the scores of psychological resilience. It was observed that as the control levels increase, the levels of cleanliness, slowness, doubt, rumination, maudsley obsessive compulsive, anxiety, avoidance and social anxiety increase; psychological resilience levels decreased. When the studies in the literature were examined, it was concluded that there were no studies that brought together OCD levels, social anxiety and psychological resilience on a common ground. The fact that research is generally handled within the framework of OCD is a gap in the literature. In this context, the results obtained regarding the effect of OCD on the level of social anxiety and psychological resilience are important in terms of closing the gaps in the literature.

It was determined that psychological resilience levels negatively predict Maudsley obsessive compulsive disorder. However, it was observed that anxiety and avoidance levels do not predict Maudsley obsessive compulsive disorder. Social anxiety and resilience explain 38% of the change in Maudsley obsessive compulsive disorder among participants. In the literature, there are studies conducted on people diagnosed with obsessive compulsive disorder recently. When we look at the literature, there is a study showing that psychological resilience predicts OCD (Piryaei et al., 2014; Lewis et al.,2012). It also shows that contagion obsession and cleaning compulsion increase during epidemics (Lensi et al., 1996). Since psychological resilience is expressed as the ability to adapt despite adverse conditions, individuals can cope with OCD symptoms more easily due to their high resilience. The findings of this study show that psychological resilience levels are negatively related to OCD variables but do not act together. This situation can be explained by the fact that psychological resilience protects and distances the person from OCD. The fact that most of the participants are women and the high level of education can be counted among the limitations of the study. The strengths of the study are that it allows quantitative evaluation of OCD effects by comparing OCD scores of individuals and that the data is an evidence-based preliminary study.

Limitations

The study is limited to the participants who received therapy and treatment with the diagnosis of OCD and accepted to work at the time of the study. The Maudsley Obsessive Compulsive Question list is limited to data from the Liebowitz Social Anxiety Scale and the Brief Resilience Scale.

Conclusion and Suggestion

Results

There are differences in the levels of maudsley obsessive-compulsive and psychological resilience according to the gender of the participants. However, levels of maudsley compulsive disorder are higher in women; psychological resilience levels are higher in men. There are differences in the levels of maudsley obsessive-compulsive and psychological resilience according to the age of the participants. However, the levels of maudsley obsessive compulsive disorder are higher in the 18-26 age group; psychological resilience levels are higher when they are 36 and above. There are differences in the levels of maudsley obsessive-compulsive according to the education level of the participants. However, levels of maudsley compulsive disorder are highest in the high school education status. There are differences in the levels of maudsley obsessive-compulsive according to the marital status of the participants. However, levels of maudsley obsessive-compulsive disorder are highest in single participants. There are weakly positive relationships between the maudsley obsessive compulsive levels and social anxiety levels of the participants; there are weakly negative and significant relationships between psychological resilience levels. As obsessive-compulsive levels increase, social anxiety levels increase while psychological resilience levels decrease. The psychological resilience levels of the participants predict Maudsley obsessive-compulsive disorder negatively. Social anxiety and resilience explain 38% of the change in obsessive-compulsive disorder in participants.

Suggestions

Suggestions for Researchers

In the results of the research, obsessions and compulsions were found to be significant for the tested variables in general. However, no significant results were found at the expected psychological resilience level. Therefore, the relationship between obsessive-compulsive scores and another variable can be examined.

This study was carried out with the participation of 400 people. Considering that studies with large groups will yield more reliable results, larger participant groups can be recommended for future research. This study is a survey model study. An experimental model can be used in research on similar topics. In this context, independent variables that have an effect on OCD, social anxiety and resilience can be examined in detail. The data collected in this study are quantitative data. In addition to these data, qualitative data can also be collected for future research. For this reason, quantitative results in research can be supported by qualitative results.

Suggestions for Clinicians

In the study, a significant relationship was found between OCD, social anxiety and psychological resilience. It is observed that as OCD scores increase, the level of social anxiety increases and the level of psychological resilience decreases. In this context, it may be recommended to give clinical support to individuals on OCD by psychologists.

Suggestions for Government

It can be suggested that informative seminars and conferences be given by experts in the field to raise awareness about OCD, social anxiety and psychological resilience.

Conflict of interest

Theauthorsdeclarenoconflicts of interest. No financialsupport has beenreceived.

EthicsCommittee

In the second stage, between January 2022 and March 2022, the Near East University Ethics Committee was applied to, and the Ethics Committee's permission (YDÜ/SB/2022/1211) was obtained and the research was started.

Author Contributions

Study Design, BA; Data Collection, BA and MK; Statistical Analysis, BA and Cİ; DataInterpretation, Cİ; ManuscriptPreparation, BA, MK and Cİ; LiteratureSearch, BA, MK and Cİ. Thepublishedversion of themanuscript has beenreadandapprovedbyallauthors.

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

RESEARCH ARTICLE

Development of the Workplace Work Environment Ergonomics Scale for Nurses

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Abstract
This study aimed to design and validate a comprehensive scale to assess ergonomic risks in the work environment for nurses. The instrument includes five subscales: Work Area Ergonomic Risks, Occupational Health and Safety, Ergonomic Risks Related to Medical Devices, Cognitive Ergonomic Risks, and Environmental Ergonomic Risks. The development process involved expert opinions for content validity and a pilot study for surface validity, leading to a 32-item draft. An exploratory factor analysis revealed a 5-factor structure, explaining 77.804% of total variance. Items with factor loadings below 0.30 were removed, resulting in a final 28-item scale. The Cronbach's alpha for the scale was found to be 0.922, indicating high internal consistency. The results of a confirmatory factor analysis also confirmed the 5-factor structure. These findings suggest that the Workplace Ergonomics Scale for Nurses is a valid and reliable tool that can aid in identifying ergonomic risks in nursing work environments. By using this instrument, healthcare organizations can implement targeted strategies to improve workplace conditions and enhance the well-being of their nursing staff. Future research should aim to verify the scale's applicability in different countries and healthcare settings.

Keywords
Nursing Ergonomics, Workplace Safety, Risk Assessment

INTRODUCTION

Nurses constitute the largest occupational group in the health sector globally, with 27.9 million employees, representing approximately 59% of healthcare professions. They are exposed to biological, chemical, psychosocial, and physical hazards in their working lives (Nguyen, Nguyen, Hoang, Hoang, & Pham, 2022). Musculoskeletal disorders (MSDs), one of the physical hazards, are currently among the most significant work-related health issues worldwide (Yilmaz & Isik Andsoy, 2022). Nurses face various health problems related to their profession, depending on the quality of care and treatment they provide, and MSDs rank first with a prevalence of 71.9% among these problems (Nguyen et al., 2022; Soler-Font et al., 2019; Westergren, Ludvigsen, & Lindberg, 2020; Yilmaz & Isik Andsoy, 2022).

The International Labor Organization (ILO) and the World Health Organization (WHO) identify MSDs as a growing occupational epidemic. MSDs account for a substantial reduction in workforce productivity among active individuals when contrasted with other non-communicable diseases. The healthcare sector experiences economic losses due to absenteeism and missed workdays caused by MSDs. The

Received: 29 March.2023 ;**Accepted:28** May 2023; **OnlinePublished:** 17 June 2023
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How to cite this article: Ağar, A., Berşe, S. And Dirgar, E. (2023). Development of the Workplace Work Environment Ergonomics Scale for Nurses. *Int J Disabil Sports Health Sci*;2023;6(2):251-260.https://doi.org/10.33438/ijdshs.1273063

difficulties encountered by nurses not only result in diminished work motivation and job satisfaction, but also give rise to negative consequences such as leaving their jobs and early retirement (Yilmaz & Isik Andsoy, 2022).

It is known that environmental, mental, personal, and working condition factors cause MSDs in nurses. Working conditions, in particular, are one of the significant factors contributing to MSDs (Nguyen et al., 2022). Nurses are known to have a high association with MSDs due to improper postures, such as lifting or positioning patients, standing for long periods, and bending or reaching (Nguyen et al., 2022). It has been found that nursing tasks performed more than 10 times a day increase the likelihood of developing work-related MSDs (Westergren et al., 2020).Additionally, nurses spend most of their time at nursing stations. Nursing stations are functional areas to coordinate patient care responsibilities, communication, and documentation of patient records (Mokarami et al., 2021). Along with this, nursing stations are a part of the monitor where patient tracking is performed by displaying data from each sensor on a computer screen for viewing patient monitor data (Webster & Weller, 2021). The location, dimensions, chair designs, furniture used, lighting, noise, and ventilation systems of these stations need to meet ergonomic requirements at an optimum level (Mokarami et al., 2021). However, due to the healthcare service job's variable structure and the need for behavioral cooperation among patients, implementing ergonomic designs is challenging (ALHazim, Al-Otaibi, & Herzallah, 2022).

Ergonomics is a multidisciplinary approach supported by three interrelated factors: physical, cognitive, and organizational. Physical factors utilize human capacity issues related to efficient and effective workplace layout and the working environment. Cognitive factors focus on mental processes related to information processing, interpretation, task analysis, human-machine interfaces, workload, and alarm philosophies and involve human senses (vision and hearing, touch, taste, smell). Organizational factors are essential for managing work responsibilities, work procedures, and communication processes (Mokarami et al., 2021). Ergonomics is also the practice of planning the job to fit the worker, rather than forcing the worker's body to fit the job. Adjusting the job activities, workstations, equipment, and tools used to fit the worker can help reduce the actual impact of the job on the worker's body and eliminate numerous potential and debilitating occupational MSDs (ALHazim et al., 2022).

Considering this background, the primary objective of the present study is to develop a valid and reliable assessment instrument that can evaluate the working environment of nurses from an ergonomic standpoint. The inspiration for creating a new scale is derived from the requirements introduced by the Occupational Health and Safety Law No. 6331, enacted in our country in 2012, and the conceptual research conducted on this subject within the past decade.

MATERIALS AND METHODS

Desing

This methodological study was conducted in a university hospital located in the Southeastern Anatolia region of Turkey between August 2022 and March 2023.

Sample

The study's population is comprised of 795 nurses working at the hospital where the research was conducted. There was no specific sampling method chosen, with the goal instead being to reach the entire population. In the literature, the sample size is sometimes determined based on the number of items in the scale being used. Studies suggest that there should be 5 or 10 observations per item (Seçer, 2013; Şencan, 2005; Yaşlıoğlu, 2017).

In this study, the draft scale consisted of 40 items, and the aim was to reach at least 200 to 400 participants. The initial sample of 389 participants was used for the exploratory factor analysis. Subsequently, for confirmatory factor analysis, 329 participants were reached. Over the course of the study, a total of 716 nurses were reached due to reasons such as being on leave, shift changes, and unwillingness to participate in the research. The participation rate was calculated as 90.06%.

Prior to the initiation of the study, ethical approval was obtained from the Non-Interventional Clinical Research Ethics Committee Presidency of Artvin Çoruh University (Date: 21.06.2022, Number: E-18457941-050.99-52839), and institutional permission was obtained from Gaziantep University Şahinbey Research and Application Hospital (Date: 01.07.2022, Number:

53892). All participating nurses were informed about the nature of the research and the data collection process, and written consent was obtained from each participant. The study adhered strictly to the principles of the Helsinki Declaration at all stages.

Scale Development Process

The process of developing the scale started with a comprehensive literature review, from which an item pool was created. A total of 40 items were prepared, drawing from the relevant literature. These 40 items were then submitted to 10 different experts, including both assessment and measurement specialists as well as subject-matter experts. The Lawshe method was employed to calculate the content validity of the items (Lawshe, 1975). In accordance with this method, an expert opinion form was developed. The objective of the scale was outlined in the form, and experts assessed the items as essential, useful but not essential, or not necessary, while also providing any suggestions they might have. Following expert feedback, 8 items with a content validity index below the threshold were eliminated, resulting in a 32-item draft scale. A pilot study was then conducted with 40 nurses using this draft scale to gather information about item comprehensibility and establish the scale's internal validity. It has been suggested that including 30 to 50 participants representative of the target population is sufficient for a pilot study (Şeker & Gençdoğan, 2014). Subsequent to the pilot study, item-total correlations and the Cronbach's alpha coefficient for the scale were computed using the SPSS analysis program. After the pilot application, an exploratory factor analysis was carried out on a larger sample (n: 389). Based on the exploratory factor analysis findings, 4 items with factor loadings below 0.30 and those assigned to a different sub-dimension were removed, resulting in a 28-item scale. A confirmatory factor analysis was then performed with a second sample (n: 329). Upon analyzing the data, the final version of the Workplace Work Environment Ergonomics Scale for Nurses was established.

Pilot Study

Following expert opinions, a pilot study was conducted on a group of 40 working nurses to test the comprehensibility of the scale and prepare it for the data collection process to represent the target audience. After the pilot study, the scale was applied to the sample group. Nurses included in the pilot study were kept out of the sample. An increase in the score obtained from the scale and its sub-dimensions indicates the presence of a work environment ergonomic risk for nurses

Data Collection &Instruments

Working nurses in the hospital were informed about the study during day and night shifts, and they were asked to complete the questionnaire at a convenient time. At the end of their shifts, the completed survey forms were collected.

The data collection form consists of two sections: the demographic characteristics form for employees and the Workplace Work Environment Ergonomics Scale for Nurses (WWEEN).

Demographic Characteristics Form

The form contains a total of 10 questions regarding the demographic characteristics of nurses, such as gender, age, educational status, marital status, duration of working at the workplace, total duration of working in the profession, working pattern, weekly working hours, position at the workplace, and the department they work in.

Workplace Work Environment Ergonomics Scale for Nurses (WWEEN):The 40-item item pool for the workplace work environment ergonomics scale draft was developed by researchers by scanning the literature based on the requirements of Law No. 6331 on Occupational Health and Safety, which was accepted in our country in 2012, and conceptual studies conducted in the literature in recent years, aiming to evaluate the activities performed for ergonomic occupational health and safety of working nurses (Apple & Letvak, 2021; Mokarami et al., 2021; Polat, Boz, Çetindere, & Duran, 2021; Zakerian, Afzalinejhad, Mahmodi, & Sheibani, 2021). The scale, designed in a Likert type ranging from "1" strongly agree to "5" strongly disagree, consists of 5 subheadings: "Environmental Ergonomic Risks" with 6 items, "Work Area Ergonomic Risks" with 14 items, "Cognitive Ergonomic Risks" with 5 items, "Ergonomic Risks Related to Medical Devices" with 10 items, and "Occupational Health and Safety" with 5 items. In the sub-dimensions of the scale, cognitive ergonomic risk factors (items 23, 24, 25) and environmental ergonomic risk factors (item 1) are reverse items. Reverse items are coded as 1→5; 2→4; 3→3; 4→2; 5→1. Opinions were obtained from 10 experts, consisting of academicians and clinician nurses working in the

field, for this item pool. Using the Lawshe technique, experts were asked to indicate their opinions on the items in the scale according to a three-point rating as "(a) Appropriate", "(b) Appropriate but needs revision", and "(c) Not Appropriate" (Lawshe, 1975; Yeşilyurt & Çapraz, 2018). Additionally, they were asked to write their opinions and suggestions for each item clearly. The content validity index (CVI) for each item was calculated by dividing the number of experts who marked the "a" option by the number of experts who provided opinions for the item (Karakoç & Dönmez, 2014; Şencan, 2005). It was decided to remove items with a content validity ratio (CVR) value below 0.50 from the scale (Lawshe, 1975). After making adjustments to the items in line with the suggestions from the experts, the draft scale was reduced to 32 items.

Data Analysis

The research data were analyzed using SPSS (Statistical Package for Social Sciences) for Windows Version 25.0 (SPSS Inc. Chicago, IL, USA) and AMOS software. To establish the construct validity of the scale, Exploratory Factor Analysis (EFA) was carried out. EFA was conducted utilizing principal components analysis and varimax methods to investigate the scale's factor structure. The data's suitability for factor analysis was assessed with the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity. Item-total correlation coefficients were recalculated to evaluate the acquired data. For reliability, Cronbach's alpha coefficient was computed. Confirmatory Factor Analysis (CFA) was employed to validate the sub-dimensions uncovered by EFA.

RESULTS

Results on Content Validity Based on Expert Opinions

Utilizing Lawshe's technique, the content validity ratio was calculated based on the opinions of 10 experts. The content validity index is calculated by dividing the number of experts who marked the obligatory option for each item by the total number of experts (Lawshe,1975; Gilbert, 2016). The acceptable content validity ratio for each item was determined to be 0.62, and it was decided to remove 8 items from the scale that were below this value (Costello et al; Lawshe, 1975). The content validity ratios of the remaining items were calculated to be 0.91. Following the recommendations of the experts, revisions were made to the items, and the draft scale was composed of 32 items.

Results on Surface Validity Related to the Pilot Study

Following the analysis of the pilot study conducted with 40 students, the Cronbach's alpha value was found to be considerably high, at 0.901. It was determined that all items in the draft scale were understandable through the pilot study.

Results Related to Participants

The research was conducted in two stages. In the first stage, 73.9% of the participants were female, 77.3% were graduates, 57.9% were married, 40.8% had been working for 1 to 5 years, 59.4% were daytime shift workers, and 49.6% were working in the service. In the second stage, 73.3% of the participants were female, 77.5% were graduates, 58.4% were married, 40.7% had been working for 1 to 5 years, 44.7% were daytime shift workers, and 49.8% were working in the service.

Results on Validity and Reliability Analysis

As seen in Table 2, the Workplace Ergonomics Scale for Nurses consists of 5 subdimensions. An exploratory factor analysis (EFA) was conducted to reveal the factor pattern of the scale. Before conducting the EFA, the Kaiser-Meyer-Olkin (KMO) test was applied to evaluate the adequacy of the sample size. The analysis revealed that the KMO value was 0.890. In accordance with this finding, it was concluded that the sample size was adequate for conducting factor analysis (Büyüköztürk, 2018). Moreover, when examining the results of the Bartlett sphericity test, it was found that the obtained chi-square value was appropriate ($x2(378) = 11043.896$; $p=0.000$). In this regard, it was accepted that the data came from a multivariate normal distribution.

After confirming the suitability of the data for factor analysis, EFA was conducted using the principal components analysis (PCA) and Varimax rotation method to examine the factor structure of the scale.

The construct validity of the 32-item Workplace Ergonomics Scale for Nurses used in the study was calculated using EFA. Four items with factor loadings below 0.30 were removed from the scale (Costello et al., 2005). Additionally, it was observed that the scale consists of 5 subdimensions.

Table 1. Demographic characteristics

	Data Set 1		Data Set 2	
Gender	**n (387)**	**%**	**n (329)**	**%**
Female	286	73.9	241	73.3
Male	101	26.1	88	26.7
Educational Level				
High School	21	5.5	20	5.9
Associate's Degree	23	5.9	16	4.9
Bachelor's Degree	299	77.3	255	77.5
Graduate Degree (Master/PhD	44	11.4	38	11.7
Marital Status				
Not specified	37	9.6	33	10
Married	224	57.9	192	58.4
Single	126	32.6	104	31.6
Lenght ofEmployment				
Less than 1 year	59	15.3	53	16.1
1-5 years	158	40.8	134	40.7
6-10 years	77	19.9	65	19.8
11-15 years	67	17.3	59	17.9
16 years and above	23	5.9	15	4.6
Employment Type				
40 hours or less	65	16.8	130	38.6
40-48 hours	230	59.4	147	44.7
More than 48 hours	89	23	52	15.8
Work Unit				
Ward	192	49.6	164	49.8
Intensive Care Unit (ICU)	51	13.2	46	14
Emergency Department	65	16.8	58	17.6
Operating Room	6	1.6	6	1.8
Outpatient Clinic	39	10.1	27	8.2
Other	34	8.8	28	8.5

The first subdimension, "work area ergonomic risk factors (F1)," consists of 9 items. The factor loadings of the items are distributed between 0.846 and 0.745. The second subdimension, "occupational health and safety (F2)," consists of 5 items, and the factor loadings of the items vary between 0.968 and 0.935. The third subdimension, "medical equipment-related factors (F3)," has factor loadings ranging between 0.854 and 0.824 and consists of 5 items. The fourth subdimension, "cognitive ergonomic risk factors (F4)," consists of 3 items, with factor loadings ranging between 0.984 and 0.981. The fifth subdimension, "environmental ergonomic risk factors (F5)," consists of 6 items, and the factor loadings of the items vary between 0.747 and 0.443.

As seen in Table 3, the explained variance of the scale was calculated to be 77.804% and the eigenvalue was found to be 10.679 as a result of the analyses. Additionally, the total Cronbach's alpha value of the scale was determined to be 0.922.

As seen in Figure 1, the scale consists of five sub-dimensions according to the results of the confirmatory factor analysis.Based on the confirmatory factor analysis, the structural equation modeling results of the scale were found to be significant at the $p \leq 0.001$ level, and all items and the multifactorial scale structure were related. When looking at the goodness of fit indices for the Nurses' Workplace Ergonomics Scale; it was determined to show acceptable fit with $\chi 2 = 3.866$, RMSEA = 0.078, and CFI = 0.922 ($p \leq 0.001$).

Table 2: Results of exploratory factor analysis of study participants

Scale Items	Workplace Ergonomic Risk Factors	Occupational Health and Safety	Medical Device-Related Factors	Cognitive Ergonomic Risk Factors	Environmental Ergonomic Risk Factors
Item1	0.846				
Item2	0.839				
Item3	0.835				
Item4	0.818				
Item5	0.818				
Item6	0.791				
Item7	0.765				
Item8	0.753				
Item9	0.745				
Item10		0.968			
Item11		0.964			
Item12		0.962			
Item13		0.958			
Item14		0.935			
Item15			0.854		
Item16			0.849		
Item17			0.847		
Item18			0.840		
Item19			0.824		
Item20				0.984	
Item21				0.982	
Item22				0.981	
Item23					0.747
Item24					0.733
Item25					0.724
Item26					0.707
Item27					0.522
Item28					0.443

Table 3: Variance analysis and reliability results

Factors	Variance (%)	Eigenvalue (λ)	Cronbach's Alpha (α)
Workplace Ergonomic Risk Factors	24.320	10.679	0.821
Occupational Health and Safety	17.321	4.427	0.945
Medical Device-Related Factors	14.653	2.921	0.693
Cognitive Ergonomic Risk Factors	10.793	2.007	0.946
Environmental Ergonomic Risk Factors	10.716	1.751	0.905
Total Explained Variance	77.804	21.785	0.922

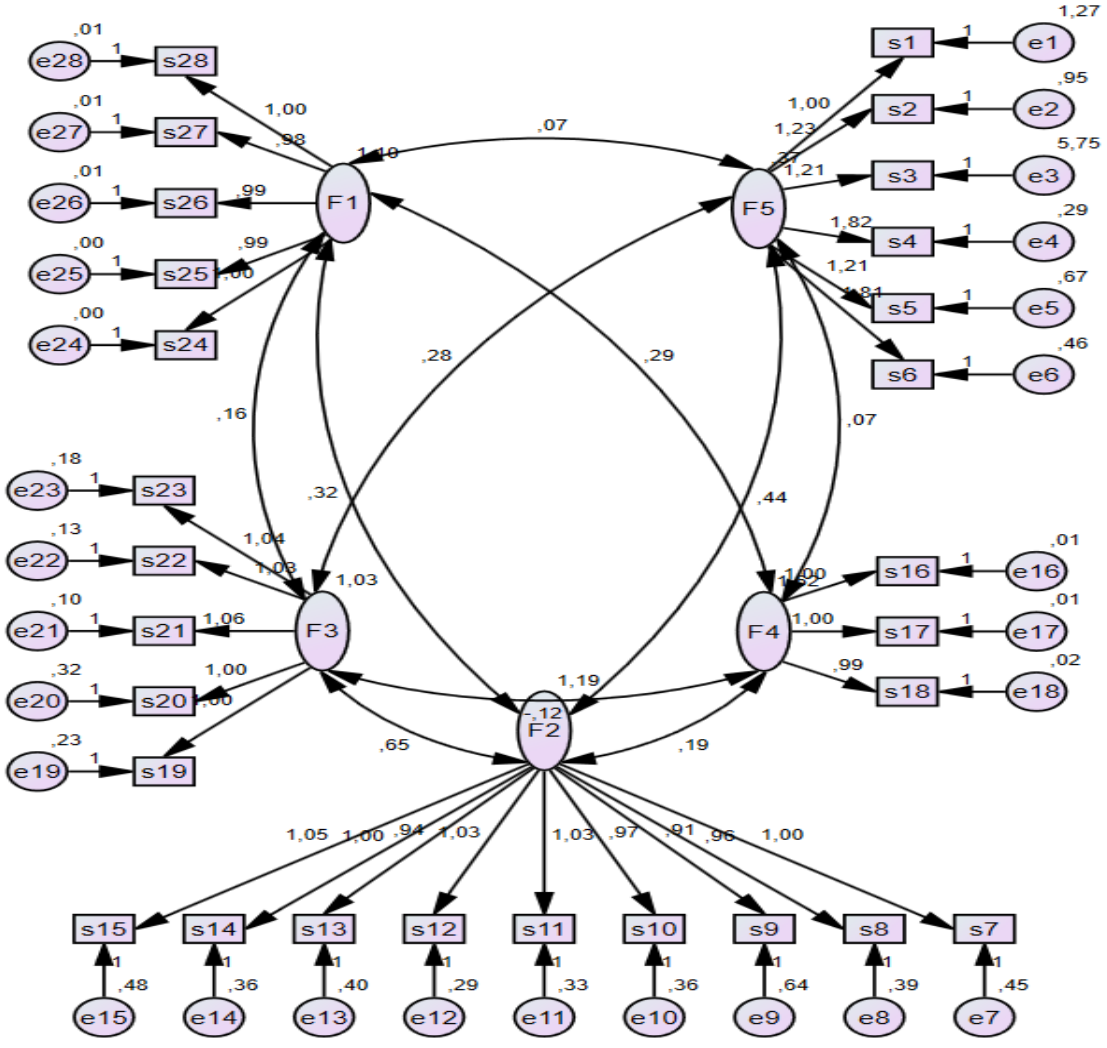

Figure 1. Scale path diagram

DISCUSSION

This study was developed to evaluate workplace ergonomics for nurses. Similar studies in the literature are very limited (ALHazim et al., 2022; Apple & Letvak, 2021; Mokarami et al., 2021; Polat et al., 2021; Webster & Weller, 2021; Yilmaz & Isik Andsoy, 2022). Moreover, there is no measuring tool to evaluate the work environment of nurses. This developed scale meets expectations in terms of filling the gap in the literature and guiding further studies.

The Nurses' Workplace Ergonomics Scale consists of 28 items and is formed from 5 sub-dimensions. These 5 sub-dimensions are "work area ergonomic risk factors (F1)", "occupational health and safety (F2)", "medical equipment-related factors (F3)", "cognitive ergonomic risk factors (F4)", and "environmental ergonomic risk factors (F5)". The Cronbach's alpha values, which are measures of internal consistency for the sub-dimensions of the scale, were calculated as follows: 0.821 for "work area ergonomic risk factors (F1)", 0.945 for "occupational health and safety (F2)", 0.946 for "medical equipment-related factors (F3)", 0.802 for "cognitive ergonomic risk factors (F4)", and 0.905 for "environmental ergonomic risk factors (F5)". The total Cronbach's alpha for the entire Nurses' Workplace Ergonomics Scale was found to be a very high 0.922, indicating a strong degree of reliability and internal consistency.The scale sub-dimensions are consistent with each other. In his study, Kılıç stated that a Cronbach's alpha value between 0.810 and 1.000 indicates high reliability, and between 0.610 and 0.800 indicates moderate reliability (Kılıç, 2016). In this study, F1, F2, F4, and F5 dimensions have high reliability, and F3 dimension has moderate reliability. Additionally, the total

score of the scale can be considered to have high reliability.

In this study, it was found that there are 5 components with eigenvalues over 1 after the factor analysis of the 28-item scale. It is considered sufficient for the explained total variance to be between 40-60%. An explained variance between 50-75% indicates that the analysis is valid and robust. In this study, the contribution of the components to the total variance is 77.804%, which indicates that the scale is valid and robust. When looking at the contributions of the sub-dimensions of the developed scale to the total variance, it was seen that the "work area ergonomic risk factors sub-dimension" contributed 24.320%, "occupational health and safety sub-dimension" contributed 17.321%, "medical equipment-related factors sub-dimension" contributed 14.653%, "cognitive ergonomic risk factors sub-dimension" contributed 10.793%, and "environmental risk factors sub-dimension" contributed 10.716%.

In the research, confirmatory factor analysis, one of the structural equation models (SEM), is used to confirm the explanatory factor analysis and to provide some fit indices for the suitability of the data obtained for the developed model. SEM is a multivariate analysis method that calculates the difference between the observed and latent matrix based on a specific theory. After applying the confirmatory factor analysis model, goodness of fit values are interpreted as acceptable and excellent fit values. Some modifications can be applied to the model to achieve these goodness of fit values. In this study, the $\chi 2/df$ ratio of the scale in the DFA analysis being below 3 indicates that the scale has excellent fit, and between 3 and 5 indicates that it has acceptable fit (Harrington, 2009). The $\chi 2/df$ ratio of the developed scale is 3.86, which indicates acceptable fit.

The comparative fit index (CFI), like the chi-square value, is sensitive to sampling. However, it is less affected by sample size compared to other indices and chi-square. The main purpose of the index is to compare the fit function of the customized model with the fit function obtained from another model taken as the basis. A CFI of 0. 95 and above is considered an excellent fit index, while 0.85 and above is considered a good fit value. In this study, the CFI value was calculated as 0.922, indicating a good fit.

The root mean square error of approximation (RMSEA) has a different calculation system than other goodness of fit values. With values ranging from 0 to 1, RMSEA indicates a minimum error between observed and generated matrices as it approaches zero. This value, which is highly sensitive to sample size, shows weak fit for 0.10 and above, acceptable fit for between 0.06 and 0.08, and good fit for 0.05 and below (Seçer, 2013). The RMSEA value of this scale was 0.078, indicating good fit

After the modifications made on the scale, most of the goodness of fit values obtained were in the good fit value ranges, while some were in the acceptable value ranges. According to the output of the DFA modeling, it was confirmed that the sub-dimensions and items of the model were significant.

Conclusion

In light of the conducted research, the successful development of the "Nurses' Workplace Ergonomics Scale" stands out as a key finding. The validity and reliability of this tool, coupled with strong internal consistency amongst its items, highlight its potential as a quantitative measure of the ergonomic landscape in nursing workplaces. Further, its encapsulation of five distinct sub-dimensions illuminates various facets of workplace ergonomics, offering a nuanced understanding that can inform future improvements in the sector. This study's pivotal contribution to healthcare management lies in its provision of a mechanism for in-depth exploration of ergonomic challenges present in nursing environments. By encompassing a broad spectrum of factors – including work area ergonomic risk factors, occupational health and safety concerns, the role of medical equipment, cognitive ergonomic risks, and environmental ergonomic factors – this scale provides a comprehensive lens through which to view and assess nursing workspaces. Furthermore, the role of the "Nurses' Workplace Ergonomics Scale" extends beyond mere assessment. It serves as a roadmap for implementing targeted interventions and proactive measures, aimed at mitigating chronic ergonomic issues and enhancing the health, productivity, and satisfaction of the nursing workforce.

In conclusion, the "Nurses' Workplace Ergonomics Scale" represents a significant milestone in healthcare research, offering a scientifically robust instrument for improving both

nursing workplaces and, ultimately, patient care outcomes. As its application spreads across diverse nursing environments, it is anticipated to become a cornerstone in the ongoing quest for healthier, more ergonomic, and effective healthcare settings.

Ethical Aspects of the Research

Before initiating the study, ethical clearance was granted from the Non-Interventional Clinical Research Ethics Committee at Artvin Coruh University (Approval Date: 21.06.2022, Approval Number: E-18457941-050.99-52839). Subsequent to obtaining ethical approval, we procured institutional authorization from Gaziantep University Sahinbey Research and Application Hospital (Approval Date: 01.07.2022, Approval Number: 53892) for conducting the research. Participating nurses were thoroughly informed regarding the research purpose and data collection methodology, and their explicit written consent was obtained. The study's entirety was conducted while steadfastly adhering to the principles enshrined in the Declaration of Helsinki.

Declaration of Conflicting Interests

All authors declare no conflicts of interest.

Funding

The author(s) received no financial supportfor the research, authorship and/or publication ofthis article.

Author Contributions

Study Design, SB and AA; DataCollection, SB; Data Interpretation, SBandED; Manuscript Preparation, SB and ED; Literature Search, SB and AA. All authors haveread and agreed to the published version of themanuscript.

Acknowledment

The researcher would like to thank to who help in the collection of data.

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

RESEARCH ARTICLE

Sebelasmaret Boccia Throw Test (SBTT) Instrument Development

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Abstract
This research aims to design Sebelasmaret boccia Throw Test (SBTT) instrument and test its validity and reliability. The research used Research and Development (R&D) method through six steps of instrument development by Gall, Gall, & Borg. 50 Indonesian boccia athletes with cerebral palsy (25 elite and 25 non-elite) participated to evaluate this instrument.In SBTT, players were instructed to throw boccia balls to the jack placed within the square, with each player given six throwing opportunities. The validity construct was tested by comparing throwing test results of elite and non-elite boccia athletes. Reliability testing was conducted by testing correlation between tests and retests. Data analysis was performed using the independent t test and Pearson correlation with the help of SPSS 16 software.Results show that there was a significant difference in SBTT test scores with p value < 0.05 and tstat (6.340) > ttable (2.011). Elite player group had higher average test score than non-elite player one, with average score of 18.56 and 8.20 respectively. This means that the SBTT is a test that can differentiate a boccia player's throwing skills based on playing experience.Test and retest results show a medium correlation on tests and retests (r = 0.707) with significant relation with p value (0.000) < 0.05. This means that boccia players have consistent performance in the SBTT test.Therefore, it is concluded that SBTT instrument is a valid and reliable instrument to assess boccia players' throwing skills.

Keywords
Development, Accuracy, Throwing, Boccia

INTRODUCTION

Calado *et al* stated that boccia is a sport of ball precision(Calado, Leite, Soares, Novais, & Arezes, 2019). Kataoka *et al* stated that boccia was designed for cerebral palsy (Kataoka, et al., 2020). Players are classified in five classes, namely BC1, BC2, BC3, BC4, and BC5 based on their throwing skill performance (Roldan, et al., 2017). In boccia, players should have high movement control in throwing red- or blue-colored ball to achieve accuracy of approaching jack ball (Fong, et al., 2012). This game is scored based on the proximity of red- or blue-colored ball to the jack which will be ranked and given points accordingly. At the end of each round, the referee measures the distance of the closest red- or blue-colored ball to the jack and gives points. The team/player awarded the highest points at the end of the game becomes the winner (Fong, et al., 2012). Boccia demands muscle control, high accuracy and concentration, and tactical awareness that should be owned by each player (Fong, et al., 2012). Therefore, boccia players need to train their throwing techniques. In line with this, research by Kataoka et al shows that throw training is effective in improving competitive performance of boccia players (Kataoka et al., 2020). In addition, Fong et al also stated that in determining sport success, training level is one of independent variables influencing

Received: 24 April.2023 ;**Accepted:15** June 2023; **OnlinePublished:** 22 June 2023
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How to cite this article: Gontara, SY. And Doewes, RI. (2023). Sebelasmaret Boccia Throw Test (SBTT) Instrument Development. *Int J Disabil Sports Health Sci*;2023;6(2):261-267.https://doi.org/10.33438/ijdshs.1286793

competitive performance (Fong, et al., 2012). In implementing planned, regular, and repeated boccia throwing technique training, one needs to apply some principles in the form of training frequency, overload, training specification, individualization, training quality, training variation, training model, training method, target, and monitoring/evaluation.

In boccia, approaching the color (red/blue) boccia ball with a jack ball is the main goal so that players will get points (Paula, Alves, Castro, Miceli, & Barbosa, 2018). Training results should be periodically and continuously evaluated to understand if the training program implemented has resulted in improved accuracy. Therefore, a boccia throwing test instrument is needed to measure throw training results. In the game's rules, points are counted based on the proximity of the colored ball to the jack. Previous test instrument was performed by placing jack balls on three-, five-, and nine-meter distances. Scoring was determined by the distance proximities of the boccia ball to the jack ball. Three points are given for 9 cm proximity, two points are given for 18 cm proximity, and one point is given for 27 cm proximity. No point is given for proximity of more than 27 cm (Morris & Wittmannova, 2010). boccia game needs accuracy. In training accuracy, boccia balls are thrown at various targets (Barak et al., 2016). Therefore, this research developed an instrument with red or blue boccia ball throwing targeted to distances of 3, 5, 7, and 9 meters. This instrument offers novelty in which the jacks are placed within six 25 cm x 25 cm squares. Each square has different points depending on its position. The squares' dimension is based on the penalty area regulated by boccia game rules while the number of squares is based on the number of boccia balls thrown in the game, in which each player is equipped with six balls in each round.

MATERIALS AND METHODS

Type of research

The researcher used Research and Development (R&D) method to design and test Sebelasmaret boccia Throw Test (SBTT) instrument. R&D research is a research activity to identify and investigate viable ideas to be applicable solutions or made into a product (Levin & Green, 2015). Measurement development steps according to Gall, Gall, & Borg (Borg, 2014) are as follows: (1) product definition; (2) target population definition; (3) needs analysis; (4) product development and identification of assessed items; (5) field test; (6) revision or final product.

a. Product definition

The product developed was an instrument of boccia throwing accuracy test named Sebelasmaret boccia Throw Test (SBTT).

b. Target population

This instrument was targeted to boccia athletes.

c. Needs analysis

This instrument was made due to the existing necessity for a boccia throwing accuracy test instrument to assess boccia players' throwing skills in approaching the jack ball. This necessity is due to boccia being a game played by throwing colored boccia ball (red/blue) to approach the jack and the scoring being based on the colored balls' proximity to the jack. Therefore, a boccia throwing accuracy test instrument is needed in order to be able to understand players' ability in throwing accuracy.

d. Product development

In developing this instrument, the researcher initially reviewed previous boccia throwing accuracy test instruments, especially those employed in previous researches. The review found a boccia throwing accuracy test instrument used in the research by Morris & Wittmannova, which became the basis of SBTT's development. The instrument by Morris & Wittmannova used jack balls as targets placed at 3, 5, and 9 meter-points. Points for scoring are based on the proximity of boccia balls to jack balls (Morris & Wittmannova, 2010). Meanwhile, this research used jack balls as targets placed within squares of 25 cm x 25 cm at 3, 5, 7, and 9 meter-points. Points for scoring are based on the balls' position within the square targets, with the highest point awarded to boccia balls touching the jack. No point is awarded for boccia balls located outside the square. This instrument was designed to test throwing ability of elite boccia players.

e. Field test

Field tests were conducted to test validity and reliability of SBTT instrument by employing 50 players with cerebral palsy. Evaluation was conducted by using SBTT in accordance with instrument guidelines.

f. Revision and final product

SBTT instrument was revised accordingly. Then, the final product was produced after the

instrument successfully generated a valid and reliable assessment.

Subjects

This research evaluated 50 Indonesian boccia players with cerebral palsy. Of the 50 players, 25 are elite players and 25 are non-elite players. Elite players here were players who had participated in the 2018 Asian Paragames while non-elite players were players who had participated in Peparnas XVI 2021. Table 1 shows a description of the subject's age, anthropometry, and playing experience data.

Table 1. Description of the subject's age, anthropometry, and playing experience data

Subject	Age (year)	Height (m)	Weight (kg)	Game experience (year)
Elite (n = 25)	27.64±1.52	1.41±0.01	46.70±2.39	7.52±0.51
Non elite (n = 25)	26.20±3.71	1.40±0.02	48.15±2.53	4.92±1.12
Total (n = 50)	26.92±2.90	1.41±0.02	47.43±2.54	6.22±1.57

Sebelasmaret boccia Throw Test (SBTT) instrument product design

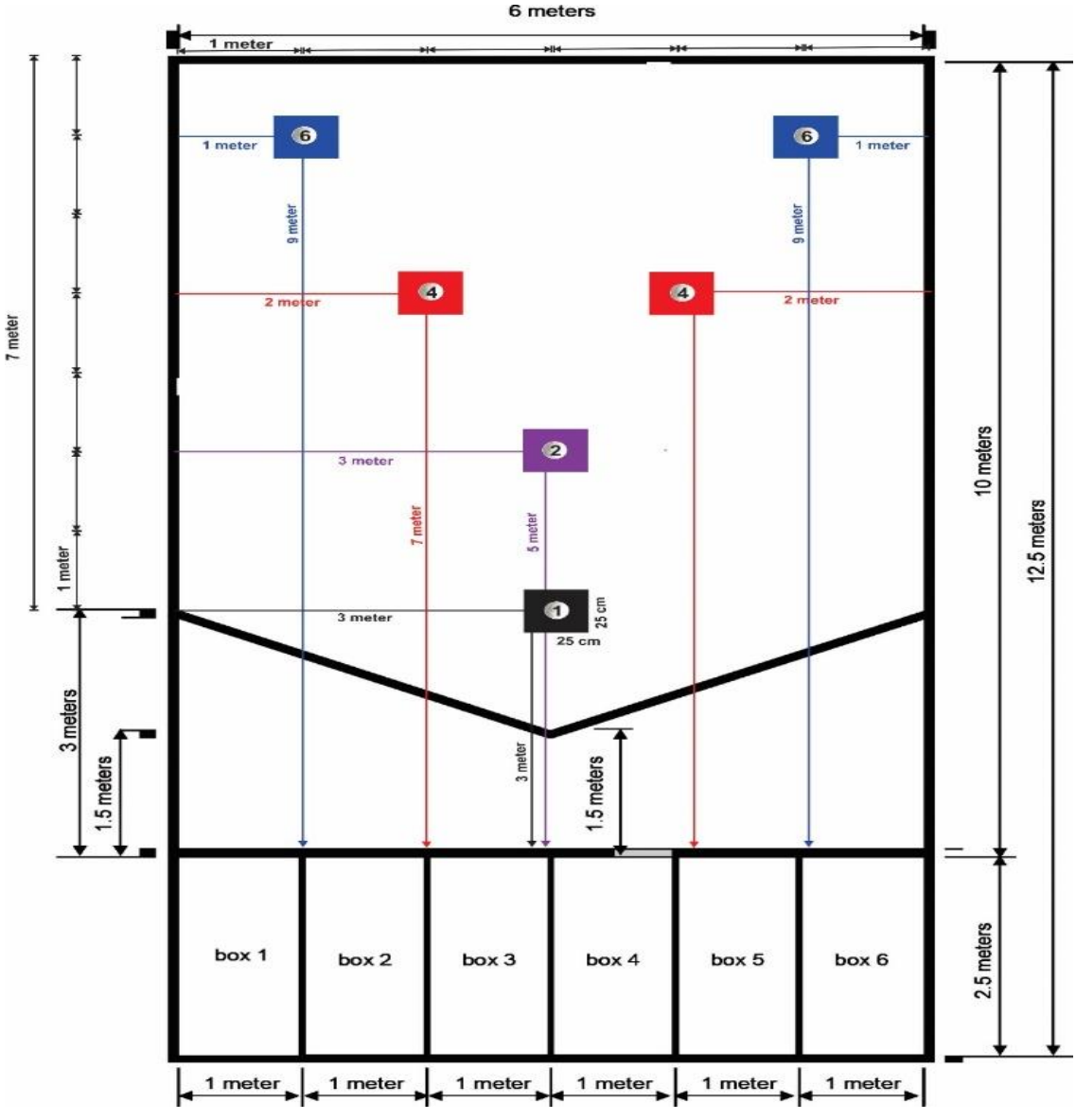

Figure 1. Systematics of sebelasmaret boccia throw test (SBTT) instrument

a. Layout

Figure 1 illustrates SBTT's layout consisting of a boccia field of 12.5 m x 6 m with six ball throwing areas (2.5 m x 1 m) and six square targets (25 cm x 25 cm) placed as illustrated.

b. Procedures

SBTT requires testees to conduct colored boccia ball (red/blue) throwing attempts targeted at the jacks within the squares. The testee was positioned in the ball throwing area and six colored boccia balls (red/blue) were provided for throwing attempts (1 ball per ball throwing area). By tester's call, the testee threw red or blue leather ball to the square targets.

c. Scoring

Assessment was based on the colored boccia ball position within the square targets, with the highest point awarded to those touching the jack ball. Testees were notified that they could only be awarded points if they could throw their boccia balls to the square targets and place them touching the jack ball. If the boccia balls thrown landed outside the square targets, they got no score. Testees showed their best throwing ability. Six throwing attempts were provided for one try. Performance score is the cumulative number of points from all correct throws at the box goal. One point is awarded if the colored boccia ball is three meters away, two points are awarded if the colored boccia ball is five meters away, four points are awarded if the colored boccia ball is at distance of seven meters, and six points are awarded if the colored boccia ball is at a distance of nine meters.

Data analysis

Validity assessment was carried out by evaluating the underhand throw skills of 25 elite players and 25 non-elite players. The reliability assessment was carried out by re-testing underhand throws on 50 players.Data distribution normality was tested by using Kolmogorov-Smirnov for each validity and reliability testing data. Independent t-test was applied to compare two boccia player groups in the validity test. To test the reliability, Pearson's correlation was applied on the test and retest results to measure to what extent scores of different individuals stay consistent (Borg, 2014). Significance value on the Pearson's correlation was determined to be $p < 0.05$. Correlation value of < 0.20 means minuscule, 0.20 – 0.50 means little, 0.51 – 0.80 means medium, and > 0.80 means large (Farhani et al., 2019).

RESULTS

Table 2. Normality test results

Group		Kolmogorov-Smirnov[a]		
		Statistic	df	Sig.
Underhand_Throw_ SBTT	Elites	.183	25	.200
	Non-elites	.235	25	.147

Table 2 shows the results of data normality tests. The sig. value of each group was > 0.05, meaning that the data was distributed normally. Data distribution was also shown in the Figure below.

Table 2, Figure 2, and Figure 3 show that data of validity test were distributed normally. Therefore, the next test was conducted by using independent t-test.

Table 3 shows that there was a significant difference on the SBTT test scores with p-value < 0.05 and t_{stat} (6.340) > t_{table} (2.011).

Elite players had higher average test scores than non-elite ones, with average test scores of 18.56 and 8.20 respectively. This is also apparent in the difference of average scores between elite and non-elite players, amounting to 10.360.

Table 4 shows the correlation test results by using Pearson's correlation. Test and retest results show medium (r = 0.707) and significant relation with p-value (0.000) < 0.05.

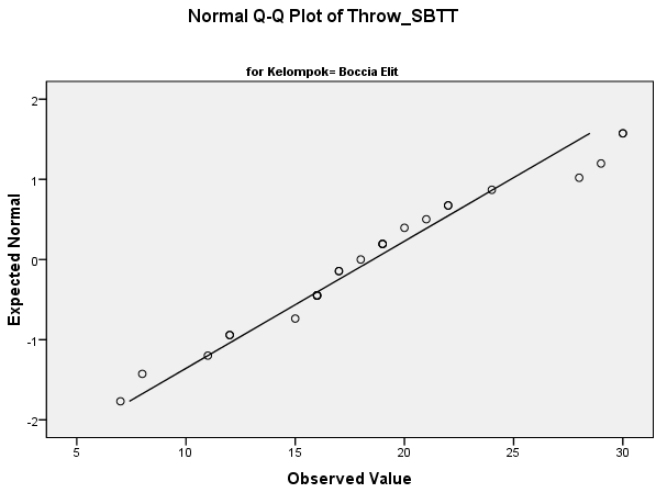

Figure 2. Data normality distribution of elite boccia players

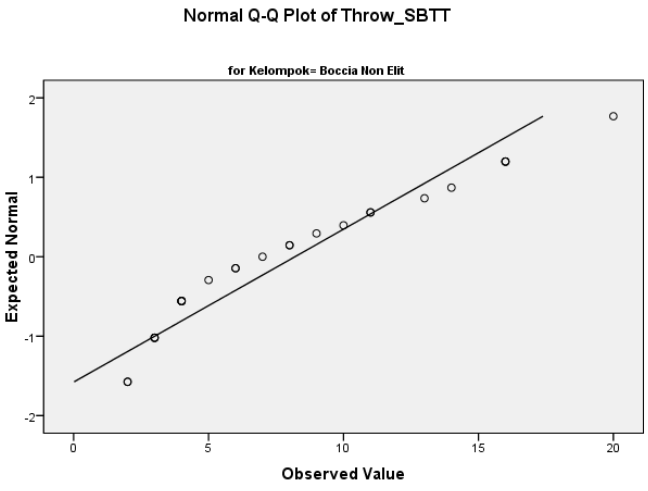

Figure 3. Data normality distribution of non-elite boccia players

Table 3. Difference of SBTT test between elites and non-elites

Testees	Mean	Mean difference	t	p-value
Elites	18.56			
		10.360	6.340	.000*
Non-elites	8.20			

*A significant difference was found between elites and non-elites ($p < 0.05$).

Table 4. SBTT tests and retests

SBTT	Pearson correlation	p-value
Tests	.707	.000
Retests	.707	.000

DISCUSSION

In this study, a newly developed instrument for assessing the throwing skills of boccia players was tested. It is important to note that all boccia players participating in this study were players with cerebral palsy. In evaluating the newly developed instrument, the researcher evaluates it with construct validity and test-retest reliability. When comparing the underhand throw skills of the two groups of players (elite and non-elite) for validity testing, the results show that there was a significant difference in SBTT test scores with p-value < 0.05 and t_{stat} (6.340) > t_{table} (2.011).Elite players had higher average test scores than non-elite ones, with average scores of 18.56 and 8.20 respectively.This difference may be due to the position of the throwing area which is in different positions, thus causing low throwing accuracy for non-elite players. Meanwhile, elite players have no problems when throwing the ball in different throwing areas. This can happen because of the playing experience of each player.Therefore, SBTT can differentiate boccia players' throwing skills based on the player's playing experience. When comparing the days of data collection conducted on two different days to test reliability, the results show medium correlation on SBTT in tests and retests (r = 0.707) having a significant relation with p-value (0.000) < 0.05.This means that boccia players had consistent performance in doing SBTT tests and no influence from training was present during test-and-retest implementation.

Although previous studies have also developed boccia throwing instruments such as Oliveira et al (2021). However, there are still differences in terms of methodology, scoring criteria, procedure design, instrument design, and the boccia players involved, limiting the differences with this study. If Oliveira et al (2021) designed an instrument with the concept of target sizes with different resolutions. In this study, the instrument was designed with the concept of different throwing distances, four throwing distances of three, five, seven, and nine meters were understood as the throw limits since boccia players need to have good response to reach accuracy of the proximity to the jack ball , such as changing in throwing movement pattern and throwing speed.Research by Reina et al shows the existence between movement and result variability

conducted by boccia players, in which a positive correlation was found between throwing speed and accuracy for 5-meter distance (Reina et al., 2018). SBTT was designed with four distance limits with six target positions to adjust with boccia game condition, in which jack balls are placed in various positions. Supporting this statement, Reina et al stated that in the game there will be situations in which ball position usually changes after each throw, and therefore necessitates different response by boccia players in handling the changing position, which becomes a challenge to them in reaching accuracy (Reina et al., 2018).

Based on the results, it is concluded that SBTT is a valid and reliable instrument for testing throwing skills of boccia players. SBTT is a test that can differentiate the levels of throwing skills of boccia players according to their playing experience. Boccia players employed in this research showed consistent results in SBTT testing. Thus, SBTT can be used to assess throwing skills of boccia players.

Acknowledment

The authors acknowledge all the support provided by LPPM Sebelas Maret University.

Conflict of interest

The authors declare no conflict of interest. No financial support was received.

Ethics Statement

The approval of the Health Research Ethics Committee of Komısı Ethic Penelıtıan Kesehatan (Protocol number 685/VI/HREC/-2021).

Author Contributions

Study Design, SYG and RID; Data Collection, RID; Statistical Analysis, SYG and RID; Data Interpretation, SYG and RID; Manuscript Preparation, SYG and RID; Literature Search, SYG and RID. 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

REVİEW

The Effect of the Physical Activity and Exercises on the Cardiovascular System of Individuals with Down Syndrom

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Abstract
Individuals with Down syndrome seem to be more likely to have congenital heart disease (CHD). This situation has led to the need to investigate the effects of exercise and physical activity practices for adults with Down syndrome and to present the results by bringing them together. Because people should be aware of what kind of effects on the heart adults with Down syndrome will be exposed to before exercising. In this study, which is a systematic review study, the results of the studies published online were brought together and the problem situation was determined. Data collected from Web of Science and Google Scholar databases were evaluated according to the PRISMA flowchart. As a result, there are studies in which low-intensity and regular exercises have positive reflections on the cardiovascular systems. However, since there are studies showing that adults with Down syndrome have weaker cardiovescular systems, it can be thought that high-intensity exercises may force the cardiovescular systems of adults with Down syndrome and this may have negative consequences. Therefore, these factors should be considered when planning physical activity and exercise for adults with Down syndrome.

Keywords
Cardiovascular, Down Syndrome, Exercise, Physical Activity

INTRODUCTION

When the probability of people coming to the world with DS (Down syndrome) is examined, it is estimated that this figure is 1-2 per 1000 live births (Baird & Sadovnick, 1987; Frid et al., 1999; Weijerman et al., 2008). It is known to be the most common chromosomal abnormality seen in infants with DS and is a genetic condition associated with congenital heart disease (CHD) such as 22q11-deletion syndrome, Noonan syndrome, Turner syndrome and Williams syndrome (Gorlin et al., 2001; Youngson et al., 2023). This syndrome is caused by trisomy of chromosome 21 (Versacci et al., 2018). Clinical studies for individuals with DS show that; these individuals have developmental delays, facial anomalies, chronic heart diseases, and gastrointestinal malformations (Pueschel, 1990). At the same time, approximately 50% of individuals with DS are diagnosed with CHD and this is the main cause of mortality (AAP, 2001). While the average life expectancy for individuals with DS was 12 years in the 1940s, it has increased to 60 years after the 2000s (Bittles et al., 2007). Despite this statistic, it is known that infant deaths occur 5-8 times more in DS individuals compared to the general population (Weijerman et al., 2008), and the reason for this is CHD (Vis et al., 2009).

The prevalence of CHD is higher in individuals with DS (Marino & De Zorzi, 1993). Since 45-50% of all newborns with Down syndrome have a cardiac anomaly, cardiac screening is routinely recommended (AAP, 2001). It is also seen that individuals with DS in the

Received: 26 January.2023 ; **Accepted:** 13 April 2023; **Online Published:** 23 April 2023
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How to cite this article: Canpolat, B. (2023). The Effect of the Physical Activity and Exercises on the Cardiovascular System of Individuals with Down Syndrom. *Int J Disabil Sports Health Sci*. 2023;6(2):268-278.https://doi.org/10.33438/ijdshs.1242879

community have lower cardiovascular endurance (Fernhall et al., 1996; Graham & Reid, 2000). The main causes of this situation are sedentary lifestyle, weakness in the muscles, problems with circulation and low maximal heart rate (K. H. Pitetti & Boneh, 1995).

It is conceivable that poor cardiovascular condition may pose a risk for physical activities in individuals with DS, as in all people (Rimmer et al., 2004). Although this problem considers whether it is dangerous for individuals with DS to participate in regular physical activities, there are studies showing the positive effects of cardiovascular exercises for individuals with DS. However, physical activities that suddenly increase the heart rate can also negatively affect individuals with DS due to the greater likelihood of CHD. In general, nevertheless, studies speak of a positive association of exercise with different types of ailments. So that; It is known that regular physical activity has a positive effect on adults with immunodeficiency virus or acquired immunodeficiency syndrome (O'Brien et al., 2010), people with rheumatoid arthritis (C. Van den Ende et al., 1998), and people with mild to moderate heart failure. It has also been reported that physical activities aimed at improving the cardiovascular system significantly reduce mortality for people with coronary heart disease (Jolliffe et al., 2001). At the same time, it is seen that cardiovascular exercise programs have a positive effect on endurance and maintaining physical activity (Rees et al., 2004). Therefore, the aim of this research is to reveal how physical activity affects individuals with DS. Therefore, within the scope of the research, the studies in the literature were examined by making a systematic review and the effects of different physical activity programs on individuals with DS were evaluated.

MATERIALS AND METHODS

The study method was determined as a systematic compilation in order to present the current information to the reader in an impartial way, and the PRISMA flow chart was used as a method (Green et al., 2006; Gulpinar & Gucal Guclu, 2014; Moher et al., 2009).

According to the inclusion and exclusion criteria, 20 studies involving subjects with adult DS were included and were generally randomized clinical trials.

Data Collection Process

Data collection in this study consists of the following processes:

1.Literature determination,
2.Literature review,
3.Literature selection based on specified eligibility criteria,
4.Determining the studies to be included in the research.

For the first phase, a literature review was conducted for articles published from January 1992 to October 2022. Printed and electronic publications are the most common methods of publishing scientific research today. However, electronic publication of research carried out with the influence of technology is more practical for accessing information. Therefore, within the scope of the research, the researches made by scanning the keywords "down syndrome, cardiovascular and exercise" in Web of Science and Google Scholar databases were determined. A long period of 30 years has been chosen in order to include general information chronologically and to see the information updates over time. Searching the Web of Science database using keywords, 145 articles were found. While 4230 studies appeared in the Google Scholar database, a total of 182 studies were examined according to inclusion and exclusion criteria.

Criteria of Inclusion in the Research

- Studies containing keywords.
- English publications.
- The sample group is DS.
- Studies proving the cardiovascular effects of exercise practices in DS individuals.
- Studies involving DS individuals aged 18 and over.

Criteria of Exclusion in the Research

- Studies in which the cardiovascular effects of different types of exercise in DS have not been proven.
- Repetitive works.
- No research papers.
- Studies without a suitable sample group.

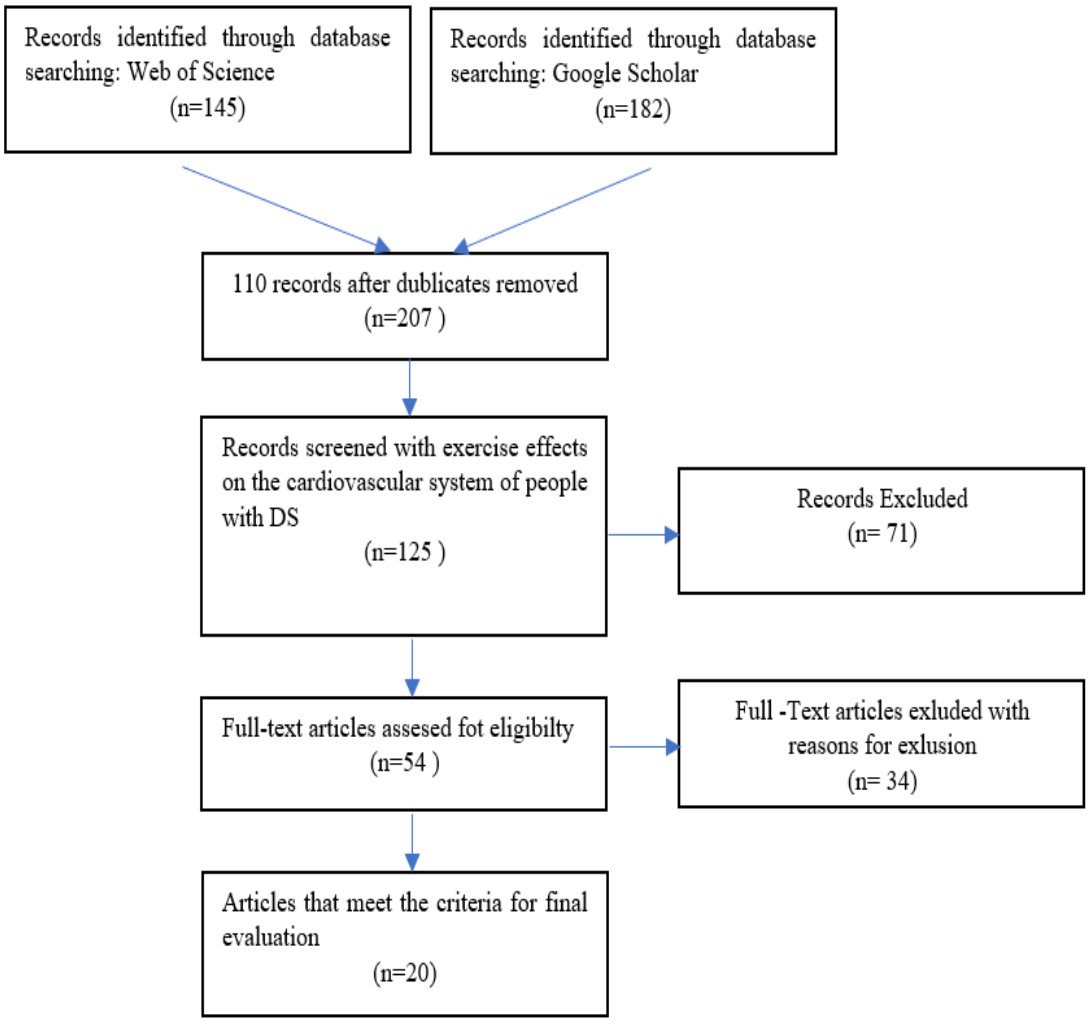

Figure 1. PRISMA Flow Chart (Moher et al., 2009)

RESULTS

Table 1. Studies on the Effects of Different Exercises and Physical Activities in Adults with DS

Reference	Study design, level of evidence	Participations (Age range and diagnosis)	N	Intervention Description	Frequency/ Duration	Conclusion
(K. H. Pitetti et al., 1992)	RCT	Adults with DS Mean Age:25.8±4 Adults without DS Mean Age:23.6±3	32	Treadmill and Schwinn Air-Dyne ergometer	5 hour/5 days in a week	Results showed that cardiovasculer capasitys of individuals with DS were inferior to their peers without DS.
(Millar et al., 1993)	RCT	Adults with DS Mean Age:17.7 CG: n = 4 IG: n = 10	14	Walking/running training program at 65-75% peak heart rate intensity	10 weeks 3 hours in a week & 30 min	After training, both the control and experimental groups showed no change in heart rate.
(K. H. Pitetti & Boneh, 1995)	RCT	Adults with DS Mean Age Male/Female 25.9±4 / 28.4±4 Adults without DS Mean Age 23.1±3/27.1±2	37	Treadmill and isokinetic dynamometry tests.	NR	The results showed significant positive associations between VO2peak and isokinetic leg strength overall. This relationship is an important result for subjects with DS.

Table1. Continued

Reference	Study design, level of evidence	Participations (Age range and diagnosis)	N	Intervention Description	Frequency/ Duration	Conclusion
(Fernhall et al., 1996)	RCT	Adults with & without DS Mean Age: NR	111	Treadmill	1-3 Minutes	Individuals with DS. have even lower peak VO2 levels than their non-Down syndrome peers; this finding is likely attenuated by the lower peak heart rates of individuals with DS.
(Balic et al., 2000)	RCT	Adults with DS & sedentary people Mean Age:18-29	27	Treadmill and isometric strength tests, explosive power, body composition.	1 year 4.9 hours per week	Peak oxygen consumption and muscle strength of the exercise group were significantly higher than the other group.
(Varela et al., 2001)	RCT	Adults with DS Mean Age:21.4 IG: 8 CG: 8	16	Treadmill and rowing ergometer.	16 weeks 5-6 hours per week	The results showed that the exercise training program had no effect on the cardiovascular systems of young people with DS. However, it has been observed that there is a factor affecting exercise endurance and working capacity.
(Tsimaras, 2003)	RCT	Adults with DS Mean age = 24.6 IG: 15 CG: 10	25	Treadmill tests	12 weeks	Significant improvements were seen in physiological parameters of VO2 peak, VE peak and peak for fatigue duration for the experimental group. No significant improvement was seen in the highest physiological parameters in the control group. It was concluded that adults with Down syndrome were able to improve their aerobic capacity when they followed a systematic and well-designed aerobic training program.
(Rimmer et al., 2004)	RCT	Adults with DS Mean Age:39.4 IG: 30 CG: 22	52	Cardiovascular and strength exercise	12 weeks 3 days in a week Cardiovascular (30 min) and strength exercise (15 min)	The cardiovascular fitness and muscular strength and endurance of the training group improved significantly compared to the control group, and there was a slight but significant reduction in body weight.
(Climstein et al., 2008)	RCT	Adults with DS Mean Age:26.1±3 Adults without DS Mean Age:24.4±3	32	Treadmill-graded exercise test	3 day measurements 2 day physical tests	The DS group had a significantly lower peak heart rate compared to the non-DS group. In terms of peak oxygen consumption, the DS group also had significantly lower peak oxygen uptake compared to the non-DS group.
(Mendonca & Pereira, 2009)	RCT	Adults with DS Aged 21-49 Mean Age:34.5±7	12	Aerobic exercise	28 weeks Two 40-min per week	While the body weight and fat percentages of the participants decreased after the exercise, the maximum exercise capacity increased by 27.8% after the training.

Table1. Continued

Reference	Study design, level of evidence	Participations (Age range and diagnosis)	N	Intervention Description	Frequency/ Duration	Conclusion
(Cowley et al., 2011)	RCT	Adults with DS IG:19 Mean Age: 29±9 CG:11 Mean Age:27±7	30	Resistance training	10 weeks 2 days per week	People with DS had a significant increase in leg strength and consequent knee joint strength, and this change was significantly greater than in the control group. In addition, the time of climbing and descending stairs of the intervention group was significantly reduced.
(Oviedo et al., 2014)	RCT	Adults with & without DS IG: 37 (9 with DS) Mean Age: 41 CG: 29 Mean Age: 46	66	Cardiovascular fitness, strength, balance, flexibility and functional ability exercise	14 weeks 3 day in a week, 1 hour/day	The intervention group showed improved cardiovascular fitness, and leg strength. Body weight and body mass index decreased in the intervention group. The control group did not change in any parameter.
(Boer & Moss, 2016)	RCT	Adults with DS Mean age: 33.8±8.6 Continuous aerobic training (CAT) Interval training (IT) Control Group (CG)	42	IT group: 10–30 seconds all out sprints 90 s of low cadence, low intensity cycling or walking. CAT group: Cycling and walking at an intensity of 70–80% of VO2 peak	12 weeks Three times a week	VO2 zirvesi ve tükenme süresi, egzersiz gruplarının ikisi için önemli ölçüde iyileşti. Ayrıca Maksimal kalp hızı ve VO2 değerleri her iki egzersiz grubunda da kontrol grubuna göre önemli ölçüde iyileşti.
(Ringenbach et al., 2016)	RCT	Adults with DS Assisted Cycling Therapy Group (ACT:17) Mean Age: 19.4 ± 4.9 Voluntary Cycling Group (VC:16) Mean Age: 18.4 ± 3.4 Inactive comparison group (NC:11). Mean Age: 17.2 ± 4.3	44	Bicycle exercise.	8 weeks	Although no significant changes were observed for power output and heart rates of the ACT and VC groups, the cadence values of the ACT group were significantly faster.
(Silva et al., 2017)	RCT	Adults with DS Aged 18-60 IG:14 CG:13	27	Wii-based exercise program	2 months 1hour/day and 3 days/week	Wii exercise with various exercise methods has been shown to significantly improve aerobic capacity and lower extremity strength of individuals with DS.
(Suarez-Villadat et al., 2020)	RCT	Children with DS Aged 12–15 IG n=15 CG n=30	45	Recreational swimming program	36 weeks Twice a week for CG three times for IG	It shows that the swimming program has an effect on the body composition of adolescents with DS, which can reduce weight levels and increase exercise capacity.

Table1. Continued

Reference	Study design, level of evidence	Participations (Age range and diagnosis)	N	Intervention Description	Frequency/ Duration	Conclusion
(Beck et al., 2021)	RCT	Adults with DS Mean Age:25 ± 3 Adults without DS Mean Age 24 ± 4	19	Anthropometrics and cardiorespiratory fitness measurements.	30 minuntes of moderately intense physical activity per day	Individuals with DS had significantly lower relative VO2peak and VO2peak corrected for total lean mass (TLM), but had similar absolute VO2peak compared with participants without DS.
(Farías-Valenzuela et al., 2021)	RCT	Adults with DS Mean Age 23.1±3.5 years	15	Motor games	10 months	The applied program showed significant improvements in total body fat, waist circumference, arm circumference and muscle area findings of individuals with DS.
(Oviedo et al., 2021)	RCT	Adults with & without DS Mean Age: 27.3±4	30	Cardiopulmonary exercise test on a treadmill.	Walking: 4 km/h, Slope increased 2.5% every 2 minutes up to 12.5%.	Individuals with DS appeared to have higher Cardiorespiratory coordination (CRC) than participants without disabilities. The findings showed that DS participants had a lower efficiency of cardiorespiratory function during exercise.
(Beck et al., 2022)	RCT	Adults with & without DS Aged 18-40	51	Cardiopulmonary exercise tests	Walking speed at a 0% incline for 2–3min.	The results show that the cardiopulmonary system of individuals with DS has some respiratory, muscular and cardiovascular disorders.

DS: Down Syndrome, MR: Mental Retardation, CG: control group, IG: intervention group, min: minutes, n: number, RCS: randomized controlled study, TD: typically developing, RCT: randomized clinical trial, NR: not reported

DISCUSSION

Studies between the years 1992-2022, which investigated how the exercises performed for individuals with DS affect to their cardiovascular systems, reveal different results. In a study conducted between 16 individuals with and without DS, significant differences were observed for cardiovescular capasity between groups. At the end of the applications using Treadmill and Schwinn Airdyne ergometer, it was seen that individuals with DS had lower quality cardiovescular capacity (K. H. Pitetti et al., 1992). In another study conducted the following year, DS individuals formed the experimental and control group of 14 people. For the experimental group with DS of 10, exercises with a MaxKHR intensity of 65-70% were applied for three days a week and for half an hour. At the end of 10 weeks, it was observed that there was no change in both the experimental and control groups (Millar et al., 1993). This situation shows that there are differences in terms of sample group for studies conducted in similar years. However, similar results may not emerge, as factors such as personal characteristics of individuals, time, place, type of application also differ.

While individuals with DS did not show different results among themselves, they showed more negative results than individuals without disability. In addition to these results, in another study involving individuals with DS and mentally disabled individuals without DS, it was observed that cardivascular coordination was associated with leg strength (K. Pitetti & Boneh, 1995). In another study conducted with 111 individuals with and without DS, some physical tests were applied. The results show that individuals with DS have lower maxVO2 levels, consistent with lower cardiovascular fitness levels. Individuals with DS have even lower maxVO2 levels than their non-DS peers (Fernhall et al., 1996).

Regular strength exercises for athletes with DS can make them stronger than sedentary

individuals without DS (Balic et al., 2000). Likewise, it has been observed that the endurance and working capacity of individuals with DS who exercise regularly are better than those with DS who do not exercise regularly. Fakat cardiovesculer capasitylerinde düzenli egzersizlerin bir etkisi olmayabilir (Varela et al., 2001). However, in favor of individuals with DS, there were significant differences in cardiovescular systems after regular exercises compared to individuals without DS (Rimmer et al., 2004; Tsimaras, 2003). However, even if the state of doing sports differentiates individuals with DS among themselves, the exercises performed gave lower results than those without DS (Climstein et al., 2008). In fact, another study has shown that individuals with DS have lower VO2 capacity than individuals with intellectual disabilities in certain age groups (Baynard et al., 2008).

In another study conducted only for individuals with DS, it was shown that aerobic exercises performed regularly for 28 weeks decreased the body fat percentage of these individuals and increased their maximum exercise capacity (Mendonca & Pereira, 2009). Findings from another study suggest that aerobic capacity and knee extensor strength limit the ability of adults with DS to perform functional tasks of daily living. It can be thought that such different physical parameters affect the daily life of individuals with DS. So much so that Cowley et al. (2010) state that randomized controlled trials should be conducted to test the possible causal relationship between exercises designed to improve physical fitness and functional tasks of daily life. Because it has been reported that individuals with DS give better results in daily activities such as isokinetic knee extensor and flexor and climbing stairs after regular exercises (Cowley et al., 2011). This suggests that individuals with DS may experience possible knee problems together with their body weight, and therefore their daily movements may be restricted. Because it is known that cardiovascular fitness, hand grip strength, leg strength and balances increase, and body weight and body mass index decrease after the training period of individuals with DS who exercise (Oviedo et al., 2014). These changes may enable individuals with DS to perform daily activities with a more appropriate physical mass.

It has been observed that regular resistance and aerobic exercises for individuals with DS also affect blood parameters. Significant reductions in some blood variables were observed after twelve weeks of aerobic and/or resistance training (Seron et al., 2015). This suggests that moderate aerobic and resistance exercises have a chronic hypotensive effect for young people with DS. In another study conducted on individuals with DS by dividing into different exercise groups, submaximal heart rate and VO2 values of individuals with DS who did aerobic exercise and did interval exercise were significantly improved in both exercise groups compared to the control group (Boer & Moss, 2016). In the applications performed in three different groups with DS for cycling activities, it was observed that the heart rate did not differ between the groups, but the bicycle cadence speed of the assisted cycling therapy group was higher. (Ringenbach et al., 2016). It has also shown that exercise games using Wii Fit or other equipment can also be attractive alternatives for adults with DS to engage in regular physical activity, prevent sedentary behavior and reduce the risk of cardiovascular disease (Silva et al., 2017). Thus, different types of exercise that emerged over the years may have different effects for individuals with DS. In addition, the fact that individuals with DS can access different exercises in developing and changing life conditions shows us different results about cardivesculer systems.

Considering the studies conducted in recent years, it has been stated that individuals with DS still have structures prone to arrhythmia even if they do not have congenital heart disease, and that 60 individuals with DS have a higher heart rate than the other 60 non-DS individuals. (Ghandi et al., 2018). However, it is also seen that exercise has a positive effect on physical parameters such as body fat percentage for individuals with DS (Suarez-Villadat et al., 2020). The decrease in body fat percentage can also have a positive effect on the cardiovascular system. Because it has been seen that the simultaneous exercise program applied with motor skill games reduces the body fat ratio and cardiovascular risk of individuals with DS (Farías-Valenzuela et al., 2021).

In another similar recent study, adults with DS showed higher Cardiorespiratory coordination (CRC) dimensionality and a higher measure of entropy than non-disabled participants. Both of these findings point to a lower efficiency of

cardiorespiratory function during exercise in participants with DS (Oviedo et al., 2021). Another study showing that PeakVO2 is higher in individuals with DS during exercise also showed that the relationship between cardiorespiratory and anthropometry fitness found in the general population is not the same in adults with DS and that anthropometry does not fully explain cardiorespiratory fitness in adults with DS (Beck et al., 2021). Another research finding supporting these results stated that adults with DS showed disorders in the cardiovascular, respiratory and muscular aspects of the cardiopulmonary system (Beck et al., 2022).

Conclusion

Studies in the field of medicine regarding the cardivesculer structure of adults with DS show that there are some differences in detail. When the studies on the effects of exercise on the cardiovescular systems for adults with DS are evaluated in general, it has been observed that various effects occur when different exercises are performed regularly. In particular, it is understood that adults with DS have a weaker cardiovescular system compared to other individuals in high-intensity exercises. However, it is thought that other physical parameters of adults with DS may also affect their cardiovescular systems. In general, weak joint and muscle structure with increasing weight reduces the mobility of adults with DS, and this may be the cause of a weaker cardivescular system with a sedentary life. As a result, regular exercises has a positive effect on various physical parameters of adults with DS. Moreover cardiovascular systems of individuals with DS give different results according to the type of exercise. There are studies in which low-intensity and regular exercises have positive reflections on the cardiovascular systems. However, since there are studies showing that adults with DS have weaker cardiovescular systems, it can be thought that high-intensity exercises may force the cardiovescular systems of adults with DS and this may have negative consequences. Therefore, it may be more appropriate to prefer low-intensity aerobic exercises when planning exercise for adults with DS.

Conflict of Interest

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

Author Contributions

Study Design, Data Collection, Statistical Analysis, Data Interpretation, Manuscript Preparation, Final review and editing, performed by the author.

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