IJDSHS

INTERNATIONAL JOURNAL OF DISABILITIES SPORTS & HEALTH SCIENCES

Volume: 5 Issue: 1 June 2022

e-ISSN 2645-9094 TURKEY

Volume:5 Issue: 1 June 2022

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

EDİTOR IN CHİEF

Assoc. Prof. Dr. Nevzat DEMİRCİ, Mersin University, TURKEY
ijdshs@gmail.com
ijdshs.editor@gmail.com

TECHNİCAL EDİTOR

Prof. Dr. Murat YAKAR, Mersin University, TURKEY

Volume:5 Issue: 1 June 2022

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

ADVİSORY BOARD

Volume:5 Issue: 1 June 2022

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 is now **index in SCOPUS and EBSCOhost™** as of January 2022. 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%).

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:5 Issue: 1 June 2022

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

INDEX COVERAGE

Scopus EBSCOhost

Academic Resource Index ResearchBib	ASOS indeks	BASE Bielefeld Academic Serch Engine	CiteFactor Academic Scientific Journals	Cosmos Indexed for Cosmos Impact Factor
DRJI	ESJI Eurasian Scientific Journal Index www.ESJIndex.org	Google Scholar	INTERNATIONAL Scientific Indexing	I2OR
idealonline	OpenAIRE	ROAD DIRECTORY OF OPEN ACCESS SCHOLARLY RESOURCES	ROOTINDEXING JOURNAL ABSTRACTING AND INDEXING SERVICE	RG
SIS	Northumbria University NEWCASTLE	OUCI Open Ukrainian Citation Index	J-Gate INDEXED	Crossref

Volume:5 Issue: 1 June 2022

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

CONTENTS
Volume 5 – Issue 1
ARTICLES

ORIGINAL ARTICLE

CASE REPORT

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

RESEARCH ARTICLE

The Relationship Between Physical Activity Level and Quality of Life of Children with Autism Spectrum Disorder

İrem SÜZEN[1*], Tuba İnce PARPUCU [2] and Hadi Şaban PARPUCU[3]

[*1]Antalya Bilim University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Antalya/TURKEY
[2]Süleyman Demirel University,Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Isparta/TURKEY
[3]Special Education and Practice School, Isparta/TURKEY
*Corresponding author: suzenn.irem@gmail.com

Abstract

Objective: The purpose of this research is to the quality of life levels of children with Autism Spectrum Disorder (ASD) and the relationship between quality of life (QoL) and physical activity (PA) level. **Materials and Methods**: 28 children with ASD participated in the research. A sociodemographic form consisting of 25 questions about the child and parents, the " Pediatric Quality of Life Inventory- Parent Form (PedsQL)" consisting of 23 questions to evaluate the QoL of children and adolescents, and the "Physical Activity Scale for Children (PAQ-C)" consisting of 9 questions to determine the level of PA was administered to the participants. **Results**: 28 children with ASD, including 8 girls and 20 boys, aged 8-18 participated in the study. The average PedsQL score of the children diagnosed with ASD was found to be 49.87±19.08. The association between children's PA level and QoL was investigated using Pearson Correlation analysis. No statistically significant correlation was determined between the PedsQL total score and the PAQ-C score ($p>0.05$). A statistically significant positive correlation was determined between psychosocial health and PAQ-C, one of the sub-scores of PedsQL ($p<0.05$). **Conclusion**: According to the research results; we can state that the psychosocial well-being of children with ASD and the social function parameter among the sub-parameters are more negatively affected. Although there is no association between children's PA levels and their QoL, there is a link between psychosocial QoL and PA levels.

Keywords
Autism Spectrum Disorder, Quality of Life, Physical Activity, Health

INTRODUCTION

Athough it has many different definitions, autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by iterative behavior petterns, weak social contact, few interests, limiting activities (Ruggeri et al., 2020; Sefen et al., 2020). DMS-5 (the Diagnostic and Statistical Manual of Mental Disorders) has defined the criteria of ASD as permanent deficiencies in communication including social interplay, iterative behaviors, both restricted interests and activities. In addition, symptoms that occur in social, occupational and other areas during early development are specified in the DMS-5. Those problems are not caused by intellectual disability (Duquette et al., 2016). While symptoms appear slowly in 70% of autistic patients, a clinical course that regresses in development between 18-24 months is observed in 30% of them (Yosunkaya, E, 2014). Some skills, such as social, communicative, behavioral, and cognitive development, may be limited by difficulty in completing age-appropriate motor skills (Ruggeri et al., 2020; Arnell et al., 2020).

Physical activity (PA) is effective for improving the healthiness of individuals with ASD. Regular PA has beneficial physical,

Received: 30 November 2021 ; **Accepted:** 17 March 2022 ; **Published:** 20 June 2022
[1]**ORCID**: 0000-0003-3683-7155, [2]**ORCID:** 0000-0002-1942-6453, [3]**ORCID**: 0000-0001-5934-608X

psychological and social effects on people, including individuals with ASD (Tiner et al., 2020). Physical inactivity is widely acknowledged as one of the century's most pressing issues in public health. Before a child reaches puberty, physical activity levels decrease and inactive behavior increases, resulting in increased health problems (Jachyra et al., 2020). Lack of physical activity defined as the leading, universal risk factor for mortality (Becerra et al., 2020). Despite the physical and developmental benefits of PA, research have shown that children with ASD have lower grades of PA than their peers who are growing normally. (Howells et al., 2019; Jachyra et al., 2020), and levels of PA decrease as they age (Arnell et al., 2020; Kim et al., 2020; Ruggeri et al., 2020). Lack of PA can cause diseases such as obesity, hyperlipidemia and hypertension (Kim et al., 2020), and has also been shown to contribute to medical sequelae such as chronic disease. (Howells et al., 2019; Jachyra et al., 2020). Considering that physical activity provides physical and cognitive benefits, it is considered to be reliable for improving general health and quality of life (QoL) (Bittner et al., 2017).

The assessment of health-related QoL, which evaluates the psychosocial, emotional and physical well-being of the person, is very suitable for conditions with multidimensional effects such as ASD (Kuhlthau et al., 2010). It has been determined that the QoL of people with ASD is lower than that of those with other chronic illnesses.(Bolbocean et al., 2021).

PA can be seen as a source of motivation to improve QoL. To measure an individual's QoL is important to determine the QoL of patients before and after treatment and to guide health studies. Considering the importance of PA to better the health and QoL of individuals with ASD, studies to understand and improve this in children with ASD have been considered important. The goal of this research is to determine the QoL levels of children with ASD and to examine the relationship between QoL and PA level. In line with the findings to be reached in this study, by revealing the QoL and PA status of children with ASD; It can be expected to be a guide in terms of protecting and increasing the quality of life.

MATERIALS AND METHODS

28 children with ASD and their parents who received special education at Gülşen Önal Special Education and Practice School in Isparta participated in this study. The study was found ethically appropriate with the decision numbered 72867572-050.01.04 of the Clinical Research Ethics Committee of Süleyman Demirel University Faculty of Medicine.

After the information was given, a voluntary consent form and a parent consent form were signed to the participants.

Inclusion criteria for the study;

1- Being diagnosed with Autism

2- To be between the ages of 8-18

3- Parents have sufficient Turkish reading and writing knowledge

4- Parent cooperation

Exclusion criteria

1- Having an orthopedic disability that will limit physical activity

2. Having Mental Retardation in Parents

3. Parent not cooperative

Data Collection Tools

The sociodemographic information of the participants was obtained using a 25-question sociodemographic questionnaire about the child and the parent; children's QoL was evaluated using a 23-question "Pediatric Quality of Life Inventory-Parent Form (PedsQL)"; and grades of PA were evaluated using a 10-question "Physical Activity Questionnaire for Children (PAQ-C)" online questionnaire.

The QoL of children and adolescents aged 2 to 18 was assessed using this measure. Physical well-being, emotional functioning, social functionality, and school functionality are all contained in the PedsQL scale. The overall score, total score of physical well-being, and total score of psychosocial well-being are the three levels of scoring. A high overall score indicates that the person has a great quality of life. Turkish reliability of the scale was done by Çakın Memik et al. (2008).

Children with ASD had their PA levels measured using the PAQ-C, which Sert and Temel converted into Turkish in 2014. Consisting of 10 questions, this scale is in a 5-point Likert type. The purpose of this survey is to measure the PA levels of children in the last 7 days. A high score on this scale means that the level of PA obtained is high.

The highest score that can be obtained from the scale is 45. Data were collected by the researcher through individual interviews in December-January 2020.

Statistical Analysis

Statistical analysis of the resarch was carried out using the SPSS 22.00 program. The mean ± standard (X ± SD) deviation of the data is expressed. Normality analysis was done with Kolmogorov-Smirnov. The association between QoL and PA scores was studied using Pearson correlation analysis. The level of significance was determined as $p \leq 0.05$.

RESULTS

The 28 of children with ASD participating in the study, 8 (28.6%) were girls and 20 (71.4%) were boys. 53.57% of the students are between the ages of 8-13, 46.42% are between the ages of 13-18. The average age of the children was 14.14± 3.92 years. The average height was 151.17±21.90 cm, the average weight was 52.01±23.97 kg, and the average age at which the diagnosis was made is 3.35±1.62 years. It was determined that the children received special education for an average of 8.58±4.03 years Table 1.

Table 1. Sociodemographic characteristics of children with ASD participating in the study

	N	Frequency	%	Mean(SD)
Age of the Child's	28			
Gender of the Child's	28	8	28,6	
Female		20	71,4	
Male				
Height of the Child's	28			151,17 (21,90)
Weight of the Child's	28			52,01 (23,97)
Age at Diagnosis	28			3,35 (1,62)
Duration of Special Education	28			8,58 (4,03)
Number of Children	28			2,32 (0,90)
Which Child Is Assessed?	28			1,89 (0,95)

The participants' PedsQL social function mean score was 41.80±28.05, the physical function mean score was 56.10±22.69, the emotional function mean score was 57.60±20.72, and the school mean score was 50.65±17.23. The participants' PedsQL total physical health score was 56.10±22.69, and the mean psychosocial score was 49.86±16.66. The mean PedsQL score of the participants was 49.87±19.08. The average PAQ-C score of the participants was determined as 14.92±6.11 Table 2.

The PedsQL total score and the PAQ-C score had no statistically significant correlation ($p>0.05$). A statistically significant positive correlation was determined between PAQ-C and psychosocial health, one of the sub-scores of PedsQL ($p<0.05$). In addition, there was a correlation between PedsQL social function parameter and PAQ-C ($p<0.05$); the correlation between the school parameter and the PAQ-C was statistically significant ($p<0.03$) Table 3

DISCUSSION

The goal of this research is to define the QoL levels and to determine the relationship between QoL and PA levels of children with ASD. The research was conducted with 28 children, 8 girls and 20 boys. It is known that the rate of autism in boys is higher than in girls. A male-female ratio of 4.3:1 of the prevalence of ASD is reported (Siracusano et al., 2021). In this study, it was determined that the highest proportion of the participants were boys (71.4%). Lower cognitive and language skills, poor social contact, few interests, limiting activities and iterative behavior petterns, lower adjustment skills and greater problem behaviors have been described in women with ASD (Siracusano et al., 2021). PA is defined as any physiological action of the skeletal muscles that reasons energy spending (Caspersen and et al., 1985). PA has many advantages for people with ASD. However, people with ASD are more likely to be physically inactive than other individuals (Thomas et al., 2018, Thinner et al., 2020)

Table 2. PedsQL and PAQ-C score of children with ASD

	N	Frequency	%	Minimum	Maximum	Mean(SD)
Total Score of PedsQL	26			,00	78,26	49,87(19,08)
Physical Well-Being Total Score of PedsQL	25			12,50	84,38	56,10(22,69)
Psychosocial Well-Being Total Score of PedsQL	25			23,33	81,67	49,86(16,66)
Social Function of PedsQL	25			,00	100,00	41,80(28,05)
Physical Function of PedsQL	25			12,50	84,38	56,10(22,69)
Emotional Function of PedsQL	25			15,00	90,00	57,60(20,72)
School Function of PedsQL	25			20,00	90,00	50,65(17,23)
Total Score of PAQ-C	28			9,00	33,00	
PAQ-C: Category	28					14,92(6,11)
Inactive		17	60,7			
Low level active		8	28,6			
Moderately active		2	7,1			
Active		1	3,6			

PedsQL: Pediatric Quality of Life Inventory**,** PAQ-C: The Physical Activity Questionnaire for Children

Table 3. The relationship between QoL and PA

		PAQ-C Total score
Total Score of PedsQL	Pearson Correlation	,293
	Sig. (2-tailed)	,147
	N	26
Psychosocial Well-Being Total Score of PedsQL	Pearson Correlation	**,426***
	Sig. (2-tailed)	**,034**
	N	**25**
Physical Well-Being Total Score of PedsQL	Pearson Correlation	,297
	Sig. (2-tailed)	,149
	N	25
Physical Function of PedsQL	Pearson Correlation	0,297
	Sig. (2-tailed)	0,149
	N	25
Emotional Function of PedsQL	Pearson Correlation	0,141
	Sig. (2-tailed)	0,500
	N	25
Social Function of PedsQL	Pearson Correlation	**0,438***
	Sig. (2-tailed)	**0,028**
	N	**25**
School Function of PedsQL	Pearson Correlation	**0,435***
	Sig. (2-tailed)	**0,030**
	N	**25**

PedsQL: Pediatric Quality of Life Inventory**,** PAQ-C: The Physical Activity Questionnaire for Children**,**
*. Correlation is significant at the 0.05 level

In this research, the average PAQ-C score of the participants was determined as 14.92±6.11. This rate is stated as low level of physical activity. The findings of this research are in line with former research findings PA behaviors in people with ASD. McCoy and Morgan (2019) found that adolescents with ASD were less likely to PA for 60 minutes or more each day and to participate in sports in the previous 12 months. They were also more likely to watch 2 hours of television. Benson et al. (2019) found that the average daily minutes of moderate-intensity physical activity of youth with ASD were half that of their non-ASD peers.

Healy et al. (2019) determined that children with ASD had significantly less moderate-intensity PA, less participation in sports, less participation in PA for 60 minutes or more. Bandini et al. (2013), parents noticed that children with ASD participate in and spend less time in significantly less PA than children with normal development. Older children with ASD were shown to be significantly less active than younger children, according to MacDonald et al. (2011). PA in children with ASD declines as they become older, according to the findings of this study.

The most common reasons reported to explain the low PA levels of children with ASD include lack of motivation, low interest in PA, including intrinsic factors such as perceived motor skill competence and little enjoyment of PA (Arnell et al., 2018); excessive time spent in inactive activities (i.e. watching TV), feeling tired, bored with physical activity, lack of peer partner, lack of time for parents, bad weather, transportation difficulties, and lack of equipment, child's lack of motivation/interest, working together a lack of existing community programs. (Stanish et al., 2015). In particular, there is strong argument that regular PA in children and adolescents improves cardiorespiratory fitness, muscle fitness, bone health, body composition (Müller et al., 2016).

In determining the health status of the person, the concept of "QoL", which shows how he perceives his own health and illness, was needed. The concept of QoL expresses the perceived satisfaction with life and personal well-being as well as representing the ability to perform daily activities. It is the perception of the individual's situation in life within the system of values in which he/she lives. An individual's physical, psychological and social health is an important indicator of quality of life (Aydiner Boylu & Paçacıoğlu, 2016, Nowak, 2019) Physical activity is of great importance in a healthy and productive life (Yıldırım et al., 2019). In this study, it was determined that the emotional function parameter, which is the sub-score of the participants, was the highest mean score (57.60±20.72) and the social function parameter was the lowest mean score (41.80±28.05). It was found that the psychosocial health total score (49.86±16.66) was lower than the physical health total score (56.10±22.69).

There are QoL studies with ASD patients and their families in the literature. The ASD group, the chronic physical disease group, and the healthy groups all had substantial disparities in QoL scores, according to Kuhlthau et al. (2010). Social functionality was revealed to be the area with the greatest differences, with children with ASD scoring lower than healthy children with chronic physical disease. It was determined that the ASD group was not distinct from the chronic physical disease group in terms of physical health and school functionality, but each group was different from the healthy group. In addition, it was found that the lowest QoL score in the ASD group was in the area of social function, and the highest score was in the area of physical health. The ability of a child to interact effectively with their environment has been shown to be directly linked to their quality of life. It was found that, the less autism-specific symptoms, such as social problems and repetitive behaviors, the greater the quality of life were discovered. Therapy or therapies that increase children's adaptive abilities or decrease repetitive behaviors have been shown to improve QoL. Given that these behaviors are socially produced, relationships with psychosocial health are likely to have a greater impact on QoL than with physical health (Kuhlthau et al., 2010).

Children and adolescents have established good relationship between PA and their physical and mental wellbeing. Rised levels of PA have been linked to improved QoL. It has also been reported that inactive behaviors are inversely proportional to QoL. It has been proven that children and adolescents who live an active lifestyle have better physical and mental health. Physical activity and inactivity have major impacts on a variety of physical, mental, and emotional elements of life (Wu et al., 2019). There was no statistically significant correlation between the overall score of the PedsQL and the overall score of the PAQ-C in this study ($p>0.05$). Psychosocial health, social function parameter, and school function parameter all had a statistically significant positive correlation with PAQ-C (p0.05). Previous research suggests that motor disorders may have an increased association with ASD-specific social symptomology. It shows that increasing PA in children with ASD reduces the severity of symptoms (Thomas et al., 2018).

Acre et al. (2006) discovered that the quality of life scores in all eight domains of the QoL scale (general well-being, physical function, mental well-being, vitality, social function, role limitations related to physical well-being (role-physical), role limitations due to emotional well-being (role-emotional), bodily pain) were significantly higher ($p < 0.05$) in the group reporting more PA as against to the group reporting less PA. Children with ASD commonly experience reduced health-related QoL with behavioral and emotional disorders. Greater motor impairment precedes, correlates, and exacerbates social communication difficulties; It has been shown to be associated with more sentimental and behavioural disorders in children with ASD (Thomas et al., 2018).

This study also has limitations that must be acknowledged; PA level was determined using self-reported questionnaire, therefore, an incorrect estimation of PA level and recall bias is inevitable. It will be important for the findings to be studied in children with ASD with a bigger sample size. Moreover to the PA habits of children with ASD, the time spent sedentary is also important. For future studies, sedentary behavior habits of children with ASD can also be investigated. Children with ASD encounter simultaneous problems in multiple areas. It is significant to research the factors related to QoL with more comprehensive evaluations.

In this research, the relationship between PA levels and QOL in children with ASD was determined and this gap in the literature was tried to be filled. PA affects human life in many ways. It helps children improve not only their physical condition but also their self-confidence, social communication skills and behavior. Therefore, it is very important to create a good standard of living in the future. In this study, it was considered important to shed light on this area by revealing the PA and QoL grades of children with ASD.

According to the research findings, there is no significant relationship between levels of PA and QoL, but it has been determined that there is a significant relationship between psychosocial QoL and PA levels. Morover, it was found that there was a statistically significant positive relationship between the social function parameter of QoL and PAQ-C, and between school functionality and PAQ-C. It has been shown that participation in PA is important for children with ASD to develop especially in the psychosocial field.

Conflict of interest

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

Ethics Statement

The participants of this study are humans. And it has been approved by the Süleyman Demirel University, Faculty of Medicine Clinical Research Ethics Committee. (Date: 21.12.2020; Decision/ Protocol number:72867572-050.01.04-). Participants who volunteered for the study were informed with a written informed consent form.

Author Contributions

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

REFERENCES

Acree, L.S., Longfors, J., Fjeldstad, A.S., Fjeldstad, C., Schank, B., Nickel, K. J., et al (2006). Physical activity is related to quality of life in older adults. *Health and Quality of Life Outcomes, 4*, 1–6.

Arnell, S., Jerlinder, K., & Lundqvist, L.O. (2018). Perceptions of Physical Activity Participation Among Adolescents with Autism Spectrum Disorders: A Conceptual Model of Conditional Participation. *Journal of Autism and Developmental Disorders, 48*(5), 1792–1802.

Arnell, S., Jerlinder, K., & Lundqvist, L.O. (2020). Parents' perceptions and concerns about physical activity participation among adolescents with autism spectrum disorder. *Autism, 24*(8), 2243–2255.

Aydıner Boylu, A., & Paçacıoğlu, B. (2016). Quality of life and indicators. *Journal of Academic Researches and Studies, 8*(15), 137–150.

Bandini, L.G., Gleason, J., Curtin, C., et al. Comparison of physical activity between children with autism spectrum disorders and typically developing children. *Autism*. 2013;17(1):44-54.

Becerra, L.A., Higbee, T.S., Vieira, M.C., Pellegrino, A.J., & Hobson, K. (2020). The effect of photographic activity schedules on

moderate-to-vigorous physical activity in children with autism spectrum disorder. *Journal of Applied Behavior Analysis*, *9999*(9999), 1–16.

Benson, S., Bender, A.M., Wickenheiser, H., Naylor, A., Clarke, M., Samuels, C.H, et al. (2018). Differences in sleep patterns, sleepiness, and physical activity levels between young adults with autism spectrum disorder and typically developing controls. *Developmental Neurorehabilitation, 1–10.*

Bittner, M.D., Rigby, B.R., Silliman-French, L., Nichols, D.L., & Dillon, S.R. (2017). Use of technology to facilitate physical activity in children with autism spectrum disorders: A pilot study. *Physiology and Behavior*, *177*(May), 242–246.

Bolbocean, C., Andújar, F.N., Mccormack, M., Suter, B., & Holder, J. L. (2021). Health - Related Quality of Life in Pediatric Patients with Syndromic Autism and their Caregivers. *Journal of Autism and Developmental Disorders*, *0123456789*.

Caspersen, C.J., Powell, K.E., Chrıstenson, G.M. (1985). Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Reports*, 100(2): 126.

Çakın Memik, N., Ağaoğlu, B., Coşkun, A., & Karakaya, I. (2008). The validity and reliability of pediatric quality of life inventory in 8 12 year old turkish children. Turkish Journal of Child and Adolescent Mental Health , *15*(2), 87–98.

Duquette, M.M., Carbonneau, H., Roult, R., & Crevier, L. (2016). Sport and physical activity: Facilitating interventions with young people living with an autism spectrum disorder. *Physical Activity Review*, *4*(June), 40–49.

Healy, S., Garcia, J.M. (2019). Psychosocial Correlates of Physical Activity Participation and Screen-Time in Typically Developing Children and Children on the Autism Spectrum. *J Dev Phys Disabil* 31 (3): 313–328

Howells, K., Sivaratnam, C., May, T., Lindor, E., McGillivray, J., & Rinehart, N. (2019). Efficacy of Group-Based Organised Physical Activity Participation for Social Outcomes in Children with Autism Spectrum Disorder: A Systematic Review and Meta-analysis. *Journal of Autism and Developmental Disorders*, *49*(8), 3290–3308.

Jachyra, P., Renwick, R., Gladstone, B., Anagnostou, E., & Gibson, B.E. (2021). Physical activity participation among adolescents with autism spectrum disorder. *Autism*. 25(3):613-626

Kim, B., Lee, D., Min, A., Paik, S., Frey, G., Bellini, S. et. al (2020). PuzzleWalk: A theory-driven iterative design inquiry of a mobile game for promoting physical activity in adults with autism spectrum disorder. *PLoS ONE*, *15*(9 September 2020), 1–24.

Kuhlthau, K., Orlich, F., Hall, T. A., Sikora, D., Kovacs, E. A., Delahaye, J., & Clemons, T. E. (2010). Health-Related Quality of Life in children with autism spectrum disorders: results from the autism treatment network. *Journal of Autism and Developmental Disorders*, *40*(6), 721–729.

McCoy, S. M., & Morgan, K. (2019). Obesity, physical activity, and sedentary behaviors in adolescents with autism spectrum disorder compared with typically developing peers. *Autism*, *136236131986157*.

MacDonald, M., Esposito, P., & Ulrich, D. (2011). The physical activity patterns of children with autism. *BMC Research Notes*, 4(1), 422.

Müller, C., Krauth, K.A., Gerß, J., & Rosenbaum, D. (2016). Physical activity and health-related quality of life in pediatric cancer patients following a 4-week inpatient rehabilitation program. *Supportive Care in Cancer*, *24*(9), 3793–3802.

Nowak, P.F., Bożek, A., & Blukacz, M. (2019). Physical Activity, Sedentary Behavior, and Quality of Life among University Students. *BioMed Research International*, *2019*.

Ruggeri, A., Dancel, A., Johnson, R., & Sargent, B. (2020). The effect of motor and physical activity intervention on motor outcomes of children with autism spectrum disorder: A systematic review. *Autism*, *24*(3), 544–568.

Sefen, J. A. N., Al-Salmi, S., Shaikh, Z., AlMulhem, J. T., Rajab, E., & Fredericks, S. (2020). Beneficial Use and Potential Effectiveness of Physical Activity in Managing Autism Spectrum Disorder. *Frontiers in Behavioral Neuroscience*, *14*(October), 1–8.

Sert Emlek, Z., & Bayık Temel, A. (2014). Questionnaire to Turkish Community for Elemantary School Students: Validity and Reliability Study. *Journal* of Dokuz Eylül University *Nursing Faculty* , *7*(2), 109–114.

Siracusano, M., Postorino, V., Riccioni, A., Emberti Gialloreti, L., Terribili, M., Curatolo, P., & Mazzone, L. (2021). Sex Differences in Autism Spectrum Disorder: Repetitive Behaviors and Adaptive Functioning. *Children*, *8*(5), 325.

Stanish, H., Curtin, C., Must, A., Phillips, S., Maslin, M., & Bandini, L. (2015). Enjoyment, Barriers, and Beliefs About Physical Activity in Adolescents With and Without Autism Spectrum Disorder. *Adapt Phys Activ Q*. 32(4):302-317.

Thomas, S., Sciberras, E., Lycett, K., Papadopoulos, N., & Rinehart, N. (2018). Physical Functioning, Emotional, and Behavioral Problems in Children With ADHD and Comorbid ASD: A Cross-Sectional Study. *Journal of Attention Disorders*, *22*(10), 1002–1007.

Tiner, S., Cunningham, G.B., & Pittman, A. (2020). "Physical activity is beneficial to anyone, including those with ASD": Antecedents of nurses recommending physical activity for people with autism spectrum disorder. *Autism*.

Wu, X. Y., Zhuang, L.H., Li, W., Guo, H.W., Zhang, J.H., Zhao, Y.K., Hu, J.W., Gao, Q. Q., Luo, S., Ohinmaa, A., & Veugelers, P. J. (2019). The influence of diet quality and dietary behavior on health-related quality of life in the general population of children and adolescents: a systematic review and meta-analysis. *Quality of Life Research*, *28*(8), 1989–2015.

Yıldırım, D., Yıldırım, A., & Eryılmaz, M. (2019). Relationship between physical activity and quality of life in health workers. *Cukurova Medical Journal*, *44*(2), 1–1.

Yosunkaya, E. (2014). Genetics and current perspectives in autism etiology. *Journal of Istanbul Faculty of Medicine*, 76 (4) , 84-88

How to cite this article: Süzen, İ., İnce Parpucu, T. and Parpucu, H.Ş. (2022). The Relationship Between Physical Activity Level and Quality of Life of Children with Autism Spectrum Disorder. *Int J Disabil Sports Health Sci*;5(1):1-8. https://doi.org/ 10.33438 /ijdshs.1010712.

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

RESEARCH ARTICLE

Comparison of Sleep Quality and Sleepiness in University Students with Different Levels of Nomophobia

Berkan TORPİL[1*], Zeynep BAHADIR AĞCE[2], Güleser GÜNEY YILMAZ[3] and Serkan PEKÇETİN[1]

[1]Health Sciences University, Faculty of Gülhane Health Sciences, Department of Occupational Therapy, Ankara, Turkey
[2]İstanbul Atlas University, Faculty, Department of Occupational Therapy, İstanbul, Turkey
[3]Kütahya Health Science University, Therapy and Rehabilitation Department, Kütahya, Turkey
*Corresponding author: berkantorpil@gmail.com

Abstract

Sleep is an important need for the maintenance of activities of daily living. With the development of technology, different types of technology addiction have emerged and it has been seen that these addictions affect sleep negatively. Nomophobia, which can negatively affect sleep, is one of these types of technology addiction and is often observed in university students. The study was planned to compare sleepiness and sleep quality in university students with different types of nomophobia. A total of 215 participants aged 18-25 enrolled to the study. Participants divided into three-groups mild nomophobia (n=67), moderate nomophobia (n=105) and severe nomophobia (n=43) according to Nomophobia Questionnaire results. Nomophobia Questionnaire, Epworth Sleepiness Scale and Pittsburgh Sleep Quality Index were used the study. A significant difference was determined between the severe nomophobic participants and the moderate and mild nomophobic participants in terms of sleepiness level and sleep duration ($p<0.05$). While sleep quality scores indicate possible sleep problems for all university students, no statistically significant difference was found in terms of different level of nomophobia groups ($p>0.05$). This study has shown nomophobia is quite common among university students, and sleepiness and sleep quality are negatively influenced by different levels of university students with nomophobia. Sleepiness is affected more negatively in university students with severely nomophobia compared to other groups. The health care providers should consider nomophobia level of university students as a confounding factor for sleepiness of university students.

Keywords
Sleep; Sleepiness; Sleep Quality; Nomophobia, University Students

INTRODUCTION

Sleep plays an important role in maintaining healthy activities of daily living. In addition, sleep is important in maintaining physical, cognitive and psychosocial health (Lund, Reider, Whiting & Prichard, 2010). Therefore, decreased sleep quality and increased sleepiness are indicated to cause potentially serious health problems (El Hangouche et al., 2018). On the other hand, authors emphasised that decreased sleep quality and increased sleepiness level were observed frequently in university students (Abo-Jedi, 2018; Peltzer & Pengpid, 2015). Various risk factors such as unhealthy living habits, nomophobia, and lack of social support have been identified as a relation to sleep problems among university students (Peltzer & Pengpid, 2015). With the advancement of technology and its acquisition of important places in daily life, different technology addictions or fear of staying away from technology have emerged, especially among university students. Also, these addictions cause sleep problems. For example, the rapid spread of the internet and smart phones can cause nomophobia in university students and this can lead to sleep problems (Torpil, Ünsal, Yıldız & Pekçetin, 2021; Li, Mei & Niu, 2006).

Received: 10 January 2022 ; **Accepted:** 01 April 2022 ; **Published:** 20 June 2022
[1]ORCID: 0000-0002-0322-5163, [2]ORCID: 0000-0002-7674-9830, [3]ORCID: 0000-0003-1781-9381, [4]ORCID: 0000-0001-5110-633X

Lately, smartphones and internet had become a daily necessity for most people and penetrate many aspects of activities of daily living due to their ease of access to workplace apps, social networks, information, healthcare, and entertainment (Oviedo-Trespalacios et al., 2019).

Nomophobia (no mobile phone phobia) which firstly introduced in the United Kingdom consists of the fear of living without a cell phone, smartphone, or internet (King, Valenca & Nardi, 2010; King et al., 2013; King et al., 2014). The term nomophobia associated with modern phobia has been pointed out as controversial, but it has also been stated as addiction to mobile phones or addiction to these devices (Rodríguez García et al., 2020;Gonçalves, Dias & Correia, 2020). Nomophobia is particularly common in university students (Rodríguez García et al., 2020).

In a study on nomophobia, researchers stated that nomophobia negatively influenced university students in many ways, such as psychosocial problems such as stress, depression, avoidance or hostility, obsessiveness, mindfulness, loneliness, academic performance problems, and insomnia problems (Rodríguez García et al., 2020). It has been determined that nomophobia causes occupational-performance problems in university students (Rodríguez García et al., 2020). Authors determined that participants have problems in many occupations such as sleeping, studying, doing sports, meeting friends (Rodríguez García et al., 2020). On the other hands, higher levels of nomophobia among university students have been significantly associated with more daytime sleepiness and more behaviors associated with poor sleep quality and sleepiness (Khayat et al., 2018; Kim & Min, 2020; Li, Mei & Niu, 2006; Peszka et al., 2020). In addition, the relationship between nomophobia and health conditions such as sleep quality, sleep disturbance, sleepiness, impaired short-term memory, dizziness, and high blood pressure, interpersonal sensitivity, obsession-compulsion and depression is worrisome (Davoudi, Manshaee & Golparvar, 2020; Gonçalves, Dias &Correia; 2020). However, no comparison was found between sleep quality and sleepiness in university students with different levels of nomophobia in the literature, and it was also stated that nomophobia and sleep-related parameters should be investigated more extensively in a systematic review study (Rodríguez García et al., 2020). The study was created to comparison of the sleepiness and the sleep quality of university students with nomophobia at different levels.

MATERIALS AND METHODS

The current study was conducted in public university faculty of health sciences students between February and March 2021

Participants

University students were invited to the present study in which convenience sampling method was used.

Inclusion criteria: (1) between the ages of 18-25; (2) owning a smart phone; (3) being nomophobic according to the Turkish Nomophobia Questionnaire; and (4) understanding verbal instructions. Exclusion criteria: (1) having any diagnosed psychiatric disease; (2) having a sleep disorder and (3) not completing the assessment.

For the current study, a sample size calculation based on error margin of 5%, 95% confidence level for a population of 900 students, and expected ratio of PTSD of 50% was run at the samplesizecalculatorwebsite:http://www.raosoft.com/samplesize.html and the result was found to be 270. From these students 49 were excluded because they did not complete the assessment and 6 were excluded due to presence of a psychiatric disease. As a result, the current study was completed with 215 participants.

Measurement

Demographic information of the participants such as age, gender, daily smart-phone usage time, and have any psychiatric or sleep disorders were obtained. The study protocol was carried out in accordance with the Helsinki Declaration of 1975 and an approval was obtained from the University of Health Sciences, Scientific Research Ethics Committee, Turkey (Ref: Go 2021/514). Written informed consent forms were obtained from all participants prior to the study. Written informed consent to participate in this study was provided by the participants.

Assessments

1-Nomophobia Questionnaire (NMP-Q)

The Turkish NMP-Q was used both in the inclusion criteria and in determining the nomophobia levels of the participants. The NMP-Q consists of 20-items rated with a 7-point Liker type (18). NMP-Q scores are interpreted as 20 points none,21-59 points mild,60-99 points

moderate, and 100-140 severe (Yildirim & Correia, 2015). The Cronbach's alpha coefficient reliability of the NMP-Q is 0.95 and the Turkish version of the NMP-Q is 0.92. (Yildirim et al., 2016).

2- The Epworth Sleepiness Scale (ESS

The Turkish ESS is a self-administered questionnaire designed to measure the overall level of daytime sleepiness (Johns, 1991). Participants rate their probability of falling asleep between 0 and 3 in 8-different situations that are frequently encountered in activities of daily living. The ESS is scored between 0-24. Higher scores on the scale indicate sleepiness (Johns, 1991). Scores between 0-9 are considered normal, while scores between 10-24 mean excessive sleepiness (Johns, 1991). The Turkish reliability and validity of the scale was made by Izci et al (Cronbach's a= 0.87) (Izci et al., 2008).

3- The Pittsburgh Sleep Quality Index (PSQI)

The Turkish PSQI was assessed to sleep quality. The PSQI consists of 18 items consisting of 7 components in a 1-month period. These items are scored on a 4-point Likert scale. The PSQI is scored out of 21 points and a score of 5 and above indicates poor sleep quality.

The PSQI was developed by Buysse et al. (1989) and adapted into Turkish version by Ağargun et al (1996). The Cronbach's alpha value for the Turkish-PSQI was 0.81.

Statistical Analyses

Data were analysed with the IBM SPSS Statistics version 25.0 statistical software package program. Data are showed as mean±standard deviation. Differences between groups were analyzed with chi square test for nominal data. Normality of data distributions was analyzed with the Shapiro Wilks test. Data were not normally. distributed. Differences between the groups were analyzed with the Kruskal–Wallis test. P values were adjusted using Bonferroni correction for multiple tests when appropriate. Level of significance was 0.05.

RESULTS

Participants were divided into 3 different levels (mild (n=67, 31.16%); moderate (n=105, 48.83%); and severely nomophobia (n=43, 20.00%)) of nomophobia according to the Turkish NMP-Q scale. The groups were comparable in terms of gender and age (p>0.05). There were statistically differences in daily smartphone usage time between groups (p<0.05). University students with severe nomophobia had more daily smartphone usage duration when compared with other nomophobia groups. Demographic data of the groups are shown in Table 1.

Table 1. Demographic characteristics of participants

	Mild Nomophobia (n=67)		**Moderate Nomophobia (n=105)**		**Severe Nomophobia (n=43)**		
Sex	**n**	**%**	**n**	**%**	**n**	**%**	**p**
Female	59	88.1	94	89.5	41	95.3	>0.05
Male	8	11.9	11	10.5	2	4.7	>0.05
	Mean±SD		**Mean±SD**		**Mean±SD**		
Age (years)	20.2±2.4		20.0±1.3		19.8±1.1		>0.05
Daily smartphone usage (hours)	5.38±2.47		5.80±2.17		6.58±2.34		**<0.05**

SD: standart deviation

There were statistically significant differences in sleepiness scores between the groups (p<0.05). Bonferroni post-hoc analysis results indicated that ESS scores were significantly higher in the university students with severe nomophobia when compared with the mild and moderate groups (p<0.05). The groups were similar in all subheadings of PSQI (p>0.05) (Table 2).

Table 2. Comparisons of PSQI and ESS scores according to different levels of nomophobia

	Mild Nomophobia	**Moderate Nomophobia**	**Severe Nomophobia**	p
PSQI	M± SD	M± SD	M± SD	
Subjective sleep quality	1.02±0.90	1.10±0.91	1.02±0.83	>0.05
Sleep latency	1.56±0.92	1.67±1.05	1.53±0.98	>0.05
Sleep duration	0.40±0.57	0.40±0.58	0.30±0.51	>0.05
Habitual sleep efficiency	0.19±0.49	0.15±0.43	0.23±0.47	>0.05
Sleep disturbances	1.56±0.67	1.44±0.57	1.48±0.50	>0.05
Use of medications for sleep	1.26±0.66	1.29±0.70	1.11±0.66	>0.05
Daytime dysfunction	062±0.64	0.68±0.52	0.72±0.54	>0.05
Total	6.65±2.72	6.76±2.95	6.41±2.91	>0.05
ESS	5.25±3.79	6.09±4.31	6.81±3.54	**<0.05***

M: Mean, SD: standart deviation PSQI, Pittsburgh Sleep Quality Index; ESS, Epworth Sleepiness Scale

DISCUSSION

In the our study was carried out to comparison of the sleepiness and sleep quality levels of university students with different nomophobia levels. According to the findings of the present study, our findings stated that participants with severe nomophobia had worse sleepiness levels compared to other groups. In addition, our findings showed that participants with severe nomophobia had more smartphones usage times than other students with nomophobia. While the sleep quality score means of the university students with nomophobia indicate a possible sleep problem, no difference was found between the sleep quality of different levels of university students with nomophobia.

Researchers emphasised that university students suffer from sleep disorders which caused poor sleep quality and high sleepiness (Levenson et al., 2016). Previous studies have shown that smartphone addiction negatively affects sleep (Kim, Min & Park, 2019; Li, Mei & Niu, 2006). Similarly, the researchers showed that the increment in duration of smartphone use in university students lead decrement in sleep quality (Özkaya et al., 2020). The researchers determined that sleep is one of the most important problems in activities of daily living of university students with nomophobia (Li, Mei & Niu, 2006; Torpil, Ünsal, Yıldız & Pekçetin, 2021). The literature suggests a connection between nomophobia, daytime sleepiness and sleep quality (Kim, Min & Park, 2019; King et al., 2014; Torpil, Ünsal, Yıldız & Pekçetin, 2021). In the our study, it was showed that participants with nomophobia had problems

The current study was conducted to comparison of the sleepiness and sleep quality with sleepiness and sleep quality. When the groups were compared, it was found that university students with severely nomophobia had worse sleepiness than other groups. This may be due to the fact that university students with severely nomophobia have a longer duration of smartphone use compared to other groups, negatively affecting sleep. On the other hand, factors such as increased exposure to smartphones due to the Covid-19 pandemic and increased duration of stay at home due to various restrictions may also be effective. We think that it will be important to develop rehabilitation approaches to prevent sleepiness and increase sleep quality in university students with nomophobia. It may be important to determine whether there is nomophobia in studies on sleep problems in university students. Further studies should study the effect of the Covid-19 pandemic on the nomophobia and sleep.

In systematic review on nomophobia, it has been observed that university students have different types of nomophobia, and this rate constitutes at least half of the students or more (Rodríguez García et al., 2020). Authors have found 17.9% had mild Nomophobia, 60% moderate and 22.1% severe Nomophobia of the total of 145 students (Farooqui, Pore & Gothankar, 2018). Another study on nomophobia, it has been determined that university students have 30.9% mild, 52.5% moderate and 16.6% severe nomophobia (Torpil, Ünsal, Yıldız & Pekçetin, 2021). In the current study, 215 participants, nomophobia scores indicate mild nomophobia at least, which revealed the importance of drawing

attention to this problem. Although the current study sample was relatively small, findings of the study were consistent with the current literature, suggesting that nomophobia is a common public health problem. Therefore, health professionals should work on the rehabilitation of nomophobia. In addition, due to the measures and restrictions during the Covid-19 pandemic process, situations such as education and social communication may increase the need for smartphones, and considering this situation, the level of nomophobia may be negatively affected. For this reason, we think that it will be important to investigate the effect of pandemic process on technology addiction such as nomophobia.

The current study has some limitations. First, small sample size required careful interpretation of findings. Second limitations of the current study are that the students participating in the study did not include university students without nomophobia and that no comparison was made. Another limitation is that has various problems may affect sleep and that should be evaluated detailly in the future research. In the current study is important in terms of revealing the problem, but the sleep assessment scales are self-reported questionnaire, so that studies that include more objective methods such as wearable devices are needed for a better understanding of the subject.

Conclusion

Nomophobia is seen quite common among university students and may influence students' daytime sleepiness and sleep quality problems. The findings showed that university students with severe nomophobia used smartphones more frequently than students with other nomophobia levels, and also the findings showed that the level of sleepiness was worse in university students with severe nomophobia. It should not be forgotten that sleep problems and nomophobia are important public health problems and may influence each other. The health care providers keep in mind nomophobia may influence sleep quality and sleepiness. This study had some limitations. Not knowing the nomophobia levels of the participants before the pandemic created a limitation in the interpretation of the results. Further studies should investigate the impact of rehabilitation approaches for nomophobia on sleep quality and sleepiness.

Acknowledment

Authors thank all participants who participated in the study.

Conflict of interests

There is no conflict of interest in the present study.

Ethical Consideration

The study protocol was carried out in accordance with the Helsinki Declaration of 1975 and an approval was obtained from the University of Health Sciences, Scientific Research Ethics Committee, Turkey (Ref: Go 2021/514). Written informed consent forms were obtained from all participants prior to the study.

Author Contributions

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

REFERENCES

Abo-Jedi, A. (2008). Cellphone addiction and its relation to self-closure in a sample of Jordanian university and Amman private university students. *The Jordanian Journal for Educational Sciences*, *4*(2), 137-150.

Ağargün, M. Y., Kara, H., & Anlar, O. (1996). The validity and reliability of the Pittsburgh sleep quality index. Turkish Journal of Psychiatry, 7(2), 107-115.

El Hangouche, A. J., Jniene, A., Aboudrar, S., Errguig, L., Rkain, H., Cherti, M., & Dakka, T. (2018). Relationship between poor quality sleep, excessive daytime sleepiness and low academic performance in medical students. *Advances in medical education and practice*, *9*, 631.

Buysse, D. J., Reynolds III, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry research*, *28*(2), 193-213.

Davoudi, R., Manshaee, G., & Golparvar, M. (2020). Comparison of the Effectiveness of Cognitive-Behavioral Therapy, Emotion focused therapy and Adolescent-centered Mindfulness Therapy on Nomophobia Symptoms and Sleep Quality of Girls with

Nomophobic Symptoms. *Iranian J. of Psychiatric Nursing.*, *7*(5), 62-71.

Farooqui, I. A., Pore, P., & Gothankar, J. (2018). Nomophobia: an emerging issue in medical institutions?. *Journal of Mental Health*, *27*(5), 438-441.

Gonçalves, S., Dias, P., & Correia, A. P. (2020). Nomophobia and lifestyle: Smartphone use and its relationship to psychopathologies. *Computers in Human Behavior Reports*, *2*, 100025.

Izci, B., Ardic, S., Firat, H., Sahin, A., Altinors, M., & Karacan, I. (2008). Reliability and validity studies of the Turkish version of the Epworth Sleepiness Scale. *Sleep and Breathing*, *12*(2), 161-168.

Johns, M. W. (1991). A new method for measuring daytime sleepiness: the Epworth sleepiness scale. *Sleep*, *14*(6), 540-545.

Khayat, M. A., Qari, M. H., Almutairi, B. S., Shuaib, B. H., Rambo, M. Z., Alrogi, M. J., ... & Alqarni, D. A. (2018). Sleep quality and internet addiction level among university students. *The Egyptian Journal of hospital medicine*, *73*(7), 7042-7047.

Kim, S. H., Min, J. W., & Park, B. K. (2019). The effect of smartphone addiction and stress on sleep quality among university students. *Journal of the Korea Academia-Industrial Cooperation Society*, *20*(4), 112-120.

King, A. L. S., Valenca, A. M., Silva, A. C. O., Baczynski, T., Carvalho, M. R., & Nardi, A. E. (2013). Nomophobia: Dependency on virtual environments or social phobia?. *Computers in human behavior*, *29*(1), 140-144.

King, A. L. S., Valença, A. M., Silva, A. C., Sancassiani, F., Machado, S., & Nardi, A. E. (2014). "Nomophobia": Impact of cell phone use interfering with symptoms and emotions of individuals with panic disorder compared with a control group. *Clinical practice and epidemiology in mental health: CP & EMH*, *10*, 28.

King, A. L. S., Valença, A. M., & Nardi, A. E. (2010). Nomophobia: the mobile phone in panic disorder with agoraphobia: reducing phobias or worsening of dependence?. *Cognitive and Behavioral neurology*, *23*(1), 52-54.

Levenson, J. C., Miller, E., Hafer, B. L., Reidell, M. F., Buysse, D. J., & Franzen, P. L. (2016). Pilot study of a sleep health promotion program for college students. *Sleep health*, *2*(2), 167-174.

Li, L., Mei, S. L., & Niu, Z. M. (2016). Influences of smartphone addiction and negative affect on sleep quality among university students. *Chin J Public Health*, *32*(5), 646-9.

Lund, H. G., Reider, B. D., Whiting, A. B., & Prichard, J. R. (2010). Sleep patterns and predictors of disturbed sleep in a large population of college students. *Journal of adolescent health*, *46*(2), 124-132.

Oviedo-Trespalacios, O., Nandavar, S., Newton, J. D. A., Demant, D., & Phillips, J. G. (2019). Problematic use of mobile phones in Australia… is it getting worse?. *Frontiers in psychiatry*, *10*, 105.

Özkaya, H., Serdar, M., Acar, H., Pekgor, S., & Arica, S. G. (2020). Evaluation of the frequency/addiction of smartphone use and its effect on sleep quality in university students. *Annals of Medical Research*, *27*(2), 657-663.

Peltzer, K., & Pengpid, S. (2015). Nocturnal sleep problems among university students from 26 countries. *Sleep and Breathing*, *19*(2), 499-508.

Peszka, J., Collins, B. T., Abu-Halimeh, N., Quattom, M., Henderson, M., Sanders, M., ... & Mastin, D. F. (2020). 0180 Sleep, Sleepiness, and Sleep Hygiene Related to Nomophobia (No Mobile Phone Phobia). *Sleep*, *43*(Supplement_1), A71-A71.

Rodríguez-García, A. M., Moreno-Guerrero, A. J., & Lopez Belmonte, J. (2020). Nomophobia: An individual's growing fear of being without a smartphone—a systematic literature review. *International Journal of Environmental Research and Public Health*, *17*(2), 580.

Torpil, B., Ünsal, E., Yıldız, E., & Pekçetin, S. (2021). Relationship between nomophobia and occupational performance among university students. *British Journal of Occupational Therapy*, *84*(7), 441-445.

Yildirim, C., & Correia, A. P. (2015). Exploring the dimensions of nomophobia: Development and validation of a self-

reported questionnaire. *Computers in Human Behavior*, *49*, 130-137.

How to cite this article: Berkan, T., Bahadır Ağce, Z., Güney Yılmaz, G. and Pekçetin, S. (2022). Comparison of Sleep Quality and Sleepiness in University Students with Different Levels of Nomophobia. *Int J Disabil Sports Health Sci*;5(1):1-8. https://doi.org/ 10.33438 /ijdshs.1056095.

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

RESEARCH ARTICLE

Which Cold Application is More Effective for Tennis Elbow? Cooling Gel vs Cold Pack

Nihan ÖZÜNLÜ PEKYAVAŞ[1*] and Senay ÇEREZCİ DUYGU[2]

[1]Başkent University, Faculty of Health Sciences, Physiptherapy and Rehabilitation Department, Ankara, Turkey
[2]University of Health Sciences, Gülhane Faculty of Health Sciences, Orthotics and Prosthetics Department, Ankara, Turkey
*Corresponding author: senay.cerezciduygu@sbu.edu.tr

Abstract

Objectives: The purpose of this study was to investigate which cold application is more effective to regulate skin temperature in patients with tennis elbow. Design: Randomized clinical study. Participants: Fifty-four patients with tennis elbow were randomly divided into 2 groups as cooling gel group (n=27) and cold pack group (n=27). Interventions: Cooling gel and cold pack applications were applied on painful lateral epicondyle region for 15 minutes. Main outcome measures: Patients were assessed before and after the application. Assessments included the severity of pain during wrist extension, evaluated by Visual Analog Scale (VAS) and thermal imaging of lateral epicondyle region evaluated by Infrared Thermography (FLIR5 Thermal Camera). Results: There were no significant differences between baseline assessments of pain severity and thermographic measurements in both groups ($p>0.05$). Significant differences were found between baseline and post-application measurements at pain and thermographic measurements in both groups ($p<0.05$). In comparison of cooling gel and cold pack groups, no significant differences were found in means of pain ($p=0.095$) and thermal imaging results ($p=0.333$). Conclusion: Both cooling gel and cold pack application are found effective in decreasing skin temperature in patients with tennis elbow and their use should be considered in treatment program.

Keywords
Thermal Analysis, Cold, Epicondylitis, Tennis Elbow, Pain

INTRODUCTION

Lateral epicondylitis (also known as tennis elbow) is a common seen pathology characterized by pain and tenderness at the lateral epicondyle region, as well as strength loss of the wrist extensors (Hong, Durand, and Loisel 2004; Goguin and Rush 2003; Barry S Kraushaar and Nirschl 1999). This is not only an inflammatory process, but also a process known as tendinosis in which fibroblastic activities and vascular responses are present. Especially changes in the collagen organization occur around the wrist extensors, especially Extensor Carpi Radialis Longus and Brevis muscles, necessitating more vascular increase with increase in inflammatory signs such as increase in skin temperature and pain (Hume, Reid, and Edwards 2006; Waseem et al. 2012). In the treatment of lateral epicondylitis, cold applications (cold pack, cooling gel, etc.), orthotics, taping, exercise therapy, electrotherapy applications, extracorporeal shockwave therapy and surgical treatment approaches are commonly used (K. Bishai and Plancher 2006; Barry S Kraushaar and Nirschl 1999; Fedorczyk 2006).

Received: 22 December 2021 ; **Accepted:** 20 April 2022 ; **Published:** 20 June 2022
[1]**ORCID**: 0000-0003-4060-9366, [2]**ORCID:** 0000-0003-0603-5688

An effective treatment of lateral epicondylitis is cold application to reduce circulation, to limit inflammation and to control pain, which is very important in the treatment and rehabilitation process. Owing to these reasons cold treatment agents are frequently used in various orthopedic disorders such as overuse injuries and sports injuries. Frequently applied cold agents are ice packs with local influences, cold packs (reduce the superficial skin temperature by 10.2±3.5°C), ice friction, ice water immersion, cold compression devices, cooler sprayers and cooler gels (Kanlayanaphotporn and Janwantanakul 2005; Lessard et al. 1997; Knight 1995).

Among the planned multidimensional treatments, thermal modalities including cold applications are frequently used. We clinically observe that cold agents increase the efficacy of treatment. According to this information and our clinical experiences, we think that using cold application may increase the effectiveness in treatment of lateral epicondylitis. As there is a lack of literature about this subject, our aim for this study was to investigate which cold application is more effective in decreasing skin temperature in patients with lateral epicondylitis.

MATERIALS AND METHODS

Study Design and Participants

This study was approved by Baskent University Institutional Review Board and Ethics Committee (Project no: KA22/141). The clinical trial number is NCT04536948. The assessments were explained in detail and the written informed consent was taken before intervention. Same physiotherapist done assessments before and after cold application.

Patients diagnosed with lateral epicondylitis by a physiatrist were included in the preliminary evaluation. Subjects with elbow pain for at least 3 months, those between 20 and 40 years of age who did not have cold allergies were included in our study. The exclusion criteria were; having any other orthopedic elbow pathology, cervical or other upper extremity pathology, elbow joint operation history, tendon rupture, limited range of motion due to humerus, radius or ulna fracture, history of osteoporosis, malignancy, hemophilia, neurological or cognitive dysfunction.

As a result of the evaluations 54 participant were included in our study and were randomly divided into two groups. The groups were as follows: Cooling Gel (n=27) (Age X±SD: 27.96±10.59, BMI X±SD: 23.61±3.79) & Cold Pack (n=27) (Age X±SD: 20.81±3.45, BMI X±SD: 21.50±2.40).

Assessments

Pain Severity: The severity of shoulder pain at rest, night and activity was evaluated by Visual Analogue Scale (VAS). Accordingly, in a line of 10 cm 0 point refers to no pain, 10 point was considered to be the maximum value of pain. Patients were asked to mark the severity of their pain on line and measured value was recorded in cm (Downie et al. 1978).

Thermographic Assessment: An infrared thermometer, FLIR E5 Thermal Camera (FLIR Systems AB, Sweden) was used for thermographic assessment. In the measurement made with infrared thermography, thermal camera receives and processes the infrared radiation emitted from the surface of the body and records the temperature distribution of the skin (Beneliyahu 1992; Vainer 2005; Cerezci Duygu et al. 2018). Each participant was evaluated in the same room (ambient temperature set to 21°C) (Loughin and Marino 2007) and participants were left for 10-20 minutes to ‘acclimatize’ to the thermographic imaging environment (Tunley and Henson 2004). The measurements were taken at a distance of about 1 meter from lateral epicondyle during wrist extension. It was reported that infrared themography may be a reliable and valid measure of treatment outcomes with clinical utility and sensitivity (Tunley and Henson 2004) (Figure 1a-b).

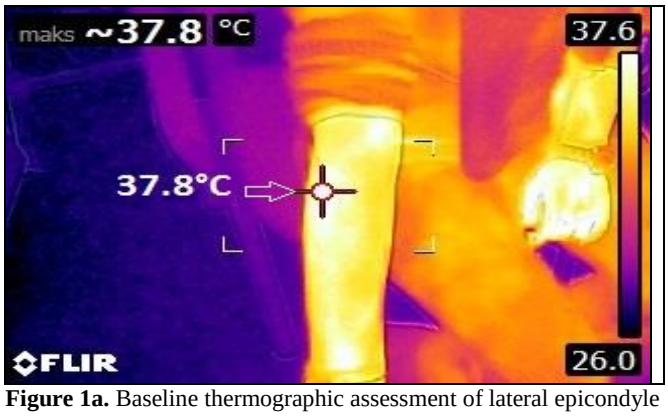


Figure 1a. Baseline thermographic assessment of lateral epicondyle

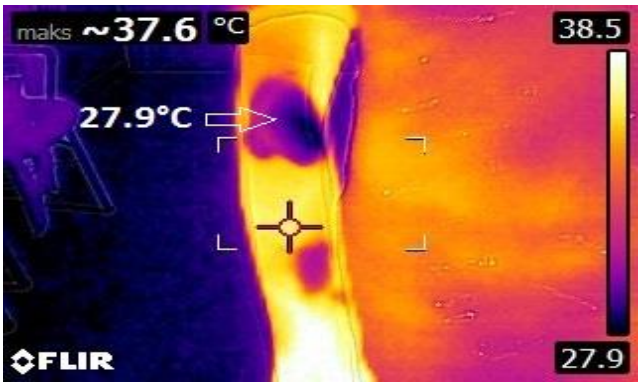


Figure 1b. Thermographic assessment of lateral epicondyle 15 minutes after cooling gel application

Treatment Protocol

Cooling Gel and Cold Pack Applications: Cooling gel (Nelsons Arnicare Arnica Cooling Gel) was applied to the lateral epicondyle region with sponge head 3 times a day ("American Medical Association | AMA" n.d.). The cooling gel was applied to the painful area around the lateral epicondyle. Cold pack was applied to the painful area for 15 minutes on a moist towel placed on the painful area around the lateral epicondyle (Wilson and Best 2005; Fedorczyk 2006).

Statistical Analysis

The power analysis indicated that 27 participants for each group were needed with 80 % power and a 5 % type 1 error. The power analysis of our study showed a power of 80% with skin temperature as the primary outcome. For statistical analysis; pain severity and thermographic values of the painful area due to lateral epicondylitis was recorded before and after application. The data were found to be non-parametric due to normality analysis. Wilcoxon Signed-Rank Test was used to compare baseline and post-application measurements. Mann Whitney-U test was used to analyze differences between groups. The level of significance was always set as $\alpha = 0.05$. All analyses were conducted using a statistical program (SPSS for Windows 21.0).

RESULTS

Both cold pack and cooling gel groups were found to be similar in terms of pain and skin temperature at baseline ($p>0.05$). Significant difference was found between baseline and post-application measurements in both group in terms of pain and skin temperature ($p<0.05$) (Table 1). Considering the differences between baseline and post-application measurements, cooling gel application group has decreased 1.5 cm in VAS for pain intensity whereas cold pack application group has decreased 1.33cm. Considering the surface temperature of the lateral epicondyle region examined in the thermographic assessment, cooling gel application group has decreased 2.64 C°, whereas cold pack application group has decreased 2.62 C°. In comparison of cooling gel and cold pack groups, the difference was not statisticly significant in terms of pain ($p=0.095$) and skin temperature ($p=0.333$)

Table 1. Differences between baseline and post-application results

	Pain (cm)			Skin temperature (°C)		
	Baseline	Post-application		Baseline	Post-application	
	X±SD	X±SD	p	X±SD	X±SD	p
Cooling Gel (n=27)	2.82±2.63	1.32±1.07	0.001*	26.42±4.50	23.78±3.45	0.015*
Cold Pack (n=27)	1.88±1.61	0.55±0.43	0.001*	24.73±1.72	22.11±2.66	≤0.01*

*p<0.05

DISCUSSION

The aim of our study was to investigate the effects of different cold applications in the treatment of lateral epicondylitis. Cold pack and cooling gel application decreased the tissue temperature and pain significantly. The difference between the two groups in reducing pain and decreasing skin temperature was not statisticliy significant.

Researchers indicate that the increased skin temperature can be determined by the thermal imaging. Increased tissue temperature is a symptom of the inflammatory process. It has been observed that overuse and pathological problems increase the tissue temperature (B S Kraushaar and Nirschl 1999). Increased temperature in inflamed tissue causes vasodilatation. Decreased tissue temperature causes vasoconstriction and reduces blood circulation. Tissue temperature is important in determining the localization of the inflammation site. Thermal camera is a technology developed to display the heat control associated with the physical functions of the skin. It helps to localize the increase and decrease in skin temperature (Coben and Padolsky 2008). In our study, thermal camera was used to assess the skin temperature of the painful area due to lateral epicondylitis. The skin temperature was re-evaluated after application of cold modalities. We found that both cooling gel application and cold pack applications decreased skin temperature equally after application. We might say that both applications are effective in decreasing skin temperature and they have no advantage over each other. As cold pack is a more conservatively used modality for cold application, we can say that cooling gel may be an alternative treatment to cold pack application.

Cold pack and cooling gel applications are the simplest and easiest treatment methods for cold application. Cold application is effective in two ways in reducing pain. First, cold application removes or reduces pain by eliminating edema and muscle spasm. Second, it is effective in relieving pain by slowing or blocking the transmission of peripheral nerves. Apart from these effects, it also reduces pain by activating the Gate-Control Theory mechanism, stimulating the touch receptors and increasing the release of substances such as endogenous (Mehmet Beyazova and Yeşim Gökçe Kutsal n.d.; Uçan and Ovayolu 2019).

Another factor we think may have an effect is that the cooling gel we use contains menthol. Menthol from Mentha plant is a refreshing and pain relief agent. Menthol can be used in cream, lotion, liquid or gel forms. When these gels are applied to the skin, they create an effect such as coolness. Local administration of menthol-containing substances also provides external analgesia. Menthol administration also alleviates pain by pulling attention away or reducing pain perception. In addition, it is stated in the literature that menthol stimulates the cortex by closing the pain gate or by increasing the release of endorphins, alleviating the pain. Menthol application is used in arthritis, various muscle-joint and tendon pains, back and neck pain, tension-related headaches and sports injuries (American Physiological Society 2004; Stanos 2007). In our study, a statistically significant result was obtained in cooling gel application to reduce pain and decrease skin temperature. It can be used as an agent to reduce pain and reduce skin temperature such as cold pack and other cold modalities.

The cooling gel is a portable and stored more easily than the cold pack and offers ease of application. While the cold package can be applied on a wet or damp towel, the cooling gel can be applied easily by applying it to the application area with a cream sponge head, which is an advantage for application. We think that both cold pack and cooling gel applications may be a part of treatment program in patients with lateral epicondylitis.

Ethics Statement

The studies involving human participants were reviewed and approved by Baskent University Institutional Review Board and Ethics Committee (Project no: KA22/141). Written informed consent to participate in this study was provided by the patients/participants.

Author Contributions

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

Declaration of conflicting interests

The authors declare no conflict of interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

REFERENCES

American Medical Association. Accessed January 8, 2018. https://www.ama-assn.org/.

American Physiological Society. (2004). *Adding Menthol to Topical Creams for Osteoarthritis Provides Significant Pain Relief*. https://www.eurekalert.org/pub_releases/2004-04/aps-amt041104.php.

Beneliyahu, D. (1992). "Infrared Thermography and the Sports Injury Practice." *Dynamic Chiropractic* 10 (7).

Cerezci Duygu, S., Ozunlu Pekyavas, N., Uzun A., Cinar Medeni, O.,Baltaci, G., Er, F., Suveren, C., & Colakoglu, F.F. (2018). "Muscle Skin Temperature Responses for Hamstring and Quadriceps to Aerobic and Anaerobic Test Conditions in Turkish Olympic Sailing Athletes." *Journal of Thermal Analysis and Calorimetry*. https://doi.org/10.1007/s10973-018-7865-8.

Coben, R., and Padolsky, I. (2008). "Infrared Imaging and Neurofeedback: Initial Reliability and Validity." *Journal of Neurotherapy* 11 (3): 3–13. https://doi.org/10.1080/10874200802126100.

Downie, W. W., Leatham, P. A., Rhind, V. M., Wright, V., Branco, J. A., & Anderson, J. A. (1978). "Studies with Pain Rating Scales." *Annals of the Rheumatic Diseases* 37 (4): 378–81.

Fedorczyk, J. M. (2006). "Tennis Elbow: Blending Basic Science with Clinical Practice." *Journal of Hand Therapy* 19 (2): 146–53. https://doi.org/10.1197/j.jht.2006.02.016.

Goguin, J. -P., & Rush, Fr. (2003). "Lateral Epicondylitis.What Is It Really?" *Current Orthopaedics* 17: 386–89. https:// doi.org/ 10.1016/S0268.

Hong, Q. N., Durand, M. J., & Loisel, P. (2004). "Treatment of Lateral Epicondylitis: Where Is the Evidence?" *Joint Bone Spine* 71 (5): 369–73.https://doi.org/10.1016/J.JBSPIN.2003.05.002.

Hume, P. A., Reid, D., & Edwards, T. (2006). "Epicondylar Injury in Sport." *Sports Medicine* 36 (2): 151–70. https://doi.org/10.2165/00007256-200636020-00005.

Bishai, S. K., & Plancher, K. (2006). The Basic Science of Lateral Epicondylosis: Update for the Future. *Techniques in Orthopaedics*. Vol. 21.https://doi.org/10.1097/01.bto.0000252115.76643.78.

Rotsalai, K. and Janwantanakul, P. (2005). "Comparison of Skin Surface Temperature during the Application of Various Cryotherapy Modalities." *Archives of Physical Medicine and Rehabilitation* 86 (7): 1411–15.

Knight, K. L. (1995). *Cryotherapy in Sport Injury Management*. Human Kinetics.

Kraushaar, B. S., & Nirschl, R. P. (1999). "Tendinosis of the Elbow (Tennis Elbow). Clinical Features and Findings of Histological, Immunohistochemical, and Electron Microscopy Studies." *The Journal of Bone and Joint Surgery. American Volume* 81 (2): 259–78.

Kraushaar, B. S., & Nirschl, R. P. (1999). "Current Concepts Review Tendinosis of the Elbow (Tennis Elbow)." *The Journal of Bone and Joint Surgery* 81-A (2): 259–77.

Lessard, L. A., Scudds, R. A., Amendola, A., & Vaz, M. D. (1997). "The Efficacy of Cryotherapy Following Arthroscopic Knee Surgery." *Journal of Orthopaedic & Sports Physical Therapy* 26 (1): 14–22. https://doi.org/10.2519/jospt.1997.26.1.14.

Loughin, C. A., & Marino, D. J. (2007). "Evaluation of Thermographic Imaging of the Limbs of Healthy Dogs." *American Journal of Veterinary Research* 68 (10): 1064–69. https://doi.org/10.2460/ajvr.68.10.1064.

Beyazova, M., & Kutsal, Y. G. eds. n.d. *Fiziksel Tıp ve Rehabilitasyon 1-2*. Güneş Tıp Kitapevleri. Accessed February 25, 2019. https://www.guneskitabevi.com/Fiziksel-Tip-ve-Rehabilitasyon-1-2,PR-130.html.

Stanos, S. P. (2007). "Topical Agents for the Management of Musculoskeletal Pain." *Journal OfPain and Symptom Management* 33 (3): 342–55. https://doi.org/10.1016/j.jpainsymman.2006.11.005.

Tunley, B. V., and Henson, F. M. D. (2004). "Reliability and Repeatability of Thermographic Examination and the Normal Thermographic Image of the Thoracolumbar Region in the Horse." *Equine Veterinary Journal* 36 (4): 306–12.

Uçan, Ö., & Ovayolu, N. (2007). " Non-pharmacological methods used in the control of cancer pain." Journal of Fırat Health Services; 2(4): 123-133.

Vainer, B. G. (2005). "FPA-Based Infrared

Thermography as Applied to the Study of Cutaneous Perspiration and Stimulated Vascular Response in Humans." *Physics in Medicine and Biology* 50 (23): R63–94. https://doi.org/10.1088/0031-9155/50/23/R01.

Waseem, M., Nuhmani, S., Ram, C. S., & Sachin, Y. (2012). "Lateral Epicondylitis: A Review of the Literature." *Journal of Back and Musculoskeletal Rehabilitation* 25 (2): 131–42.

Wilson, J. J., & Best, T. M. (2005). "Common Overuse Tendon Problems: A Review and Recommendations for Treatment." *American Family Physician* 72 (5): 811–18.

How to cite this article: Özünlü Pekyavaş, N. and Çerezci Duygu, Ş. (2022). Which Cold Application is More Effective for Tennis Elbow? Cooling Gel vs Cold Pack. *Int J Disabil Sports Health Sci*;5(1):1-8.https:// doi.org/ 10.33438 /ijdshs.1039813.

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

RESEARCH ARTICLE

Investigation of the Effect of Functional Levels of Children with Cerebral Palsy on Parents' Quality of Life in Northern Cyprus

Melis BAĞKUR[1*], Tuba YERLİKAYA[1], Bilge BAŞAKÇI ÇALIK[2] and Uğur CAVLAK[3]

[1]Near East University, Healhty Science Faculty, Physiotherapy and Rehabilitation, Nicosia, Cyprus
[2]Pamukkale University, Healhty Science Faculty, Physical Therapy and Rehabilitation, Denizli, Turkey
[3]Biruni University, Healhty Science Faculty, Physiotherapy and Rehabilitation, İstanbul, Turkey
*Corresponding author: melis.bagkur@neu.edu.tr

Abstract

The aim this research, determine the level of influence of families with children with cerebral palsy in Northern Cyprus and to reveal the difference in being affected between parents. The study was carried out on 49 children with CP and 49 couples of parents. Pediatric Functional Independence Measure (WeeFIM) was used to evaluate the functional status of children, and the Impact of Family Scale (IFS) and the Quality of Life Scale (SF-36) were used to measure the influence of families. Those with WeeFIM total score between 18-90, the group requiring observation (CNO) (n = 34), and those between 91-126 were divided into independent group (IC) (n = 15). No relationship was found between IFS, SF-36 score of parents and functional level of their children. There was a positive correlation between mothers and fathers in IFS and SF-36 scores within groups (CNO IFS p: 0,021 r: 0,394; CNO SF-36 p: 0,001 r: 0,546; IC IFS p: 0,038 r: 0,602; IC SF-36 p: 0,001 r: 0,825). When the levels of influence and quality of life of the mothers and fathers within the groups were compared, it was observed that there was not a significant difference between the mothers and fathers in the group CNO and in the IC group (p>0.05). According to this study family influences of parents with children with cerebral palsy in Northern Cyprus are not affected by their functional levels. The fact that there was no difference between mothers and fathers in terms of quality of life and level of influence revealed the geographical cultural difference in favor of women.

Keywords
Family Influence, Functional Level, Cerebral Palsy

INTRODUCTION

The birth of a child with developmental disabilities is a great stress for the family. After parents learn that they have a disabled child, they may experience many psychological problems such as anxiety, shock, denial, sadness, anger, avoiding confrontation with the attitude of the social environment, and feelings of decreased self-confidence and respect (Akmeşe et al., 2007).

Many studies have shown that; these tensions experienced by families cause problems in relationships, isolation from the social environment and deterioration of intra-family relationships (Olawale et al., 2013). Collaboration with a professional team is needed for the necessary medical interventions and rehabilitation process to combat the functional deficiencies of the child and the addictions arising from these disabilities in the long term. Parents of children with cerebral palsy (CP), who are the most important and inseparable part of this team, experience many physical, social, and emotional problems (Panteliadis, 2004; Raina et al., 2005).

Different results have been found in studies investigating the relationship between the

Received: 22 February 2022 ; **Accepted:** 03 May 2022 ; **Published:** 20 June 2022
[1]**ORCID**: 0000-0002-8022-464X, [2]**ORCID:** 0000-0002-7267-7622, [3]**ORCID:** 0000-0002-5968-0384, [4]**ORCID:** 0000-0002-5290-9107

functional level of the child with CP and the stress experienced by the family and the level of life quality. In Bosnia and Herzegovina, it has been stated that the quality of life of the mothers of children with CP is lower than the mothers of healthy children, and as the functional status of the child deteriorates, the general quality of life of the mothers is negatively affected (Glinac et al., 2017). In a study examining the psychological distress experienced by Jordanian parents, severe disability in the child with CP was related to higher mental distress in the parents. In the study, when the perceived stress and depression scores between mothers and fathers were compared, it was reported that the results were similar and the parents experienced moderate stress and depression (Al-Gamal and Long, 2013). Parkes et al. in the works carried out in 9 regions of Europe; It has been observed that the motor effects of children with CP do not cause stress on the family alone, but can cause stress when a secondary problem is added (Parkes et al., 2011).

Although psychosocial exposure and impaired quality of life have clinical significance for parents, there is no evidence of the condition of parents with children with CP in the northern part of Cyprus. This study was planned to reveal how the functional levels of children with cerebral palsy living in the northern part of Cyprus affect the family and change the quality of life of the family, as well as whether there is a difference between mother and father influence.

MATERIALS AND METHODS

Participants

In this study, 49 children with CP who were diagnosed with CP by a pediatric neurologist and who were living in Northern Cyprus and were trained in physiotherapy and rehabilitation, and their parents were included. Inclusion criteria in the study while it was determined as being diagnosed with CP and living in the north of Cyprus, non-voluntary families were not included in the study. Children with CP with a mean age of 8.45 ± 4.74 years and between 4-16 years of age participated in the study. Work permits and consents were obtained from the families of the children. For the study, ethics committee approval, dated 24.02.2017 and numbered YDU/2017/44-370, was obtained.

After the demographic information of the participants was obtained using the demographic information form and face-to-face interview method, the mothers and fathers were explained about the contents of the scales to be filled out separately.

Data Collection Tools

The Pediatric Functional Independence Scale (WeeFIM) was used to evaluate the functional status of children, the Impact of Family Scale (IFS) to evaluate the level of influence of families, and the Quality of Life Scale (SF-36) to evaluate the quality of life of the children.

Pediatric Functional Independence Measure (WeeFIM)

The pediatric physiotherapist with the functional independence scale WeeFIM evaluated the independence level of the children in daily life. WeeFIM is to measure the degree of independence performance of the child's daily living skills. It is a valid and reliable test for both disabled and healthy children to assess the functional independence of all children aged 6 months to 7 years and to monitor their development. This test can be applied to children with developmental retardation until the age of 21. It aims to question the child's self-care, transfer activities, movement activities, sphincter control, communication skills, and cognition skills under 18 headings.

In the scoring of WeeFIM sub-items, the functions of the child from 1 to 7 are scored: 7: fully independent, 6: modified independent, 5: 4: minimum assistance with observation, 3: light assistance, 2: maximum assistance and 1: full assistance. Scores from 1 to 4 indicate the child's level of assistance required to complete an activity. 5 points indicate the observation of the child to do the skill or the hint given by the adult. A score of 6 demonstrates the child can complete the activity independently however needs an assistive tool. The lowest total score that can be obtained from the test is 18 (fully dependent on all skills), the highest total score is 126 (fully independent in all skills), (Msall et al., 1994).

Children with cerebral palsy with a total score of 18-90 on the Pediatric Functional Independence Criterion taken in our study were divided into two groups as "requiring observation (CNO)" and those between 91-126 as "independent (IC)" (Çetin et al., 2017).

Impact of Family Scale (IFS)

Families' levels of affection were evaluated using the Impact of Family Scale (IFS). Developed for families or caregivers with a disabled child, this scale evaluates the burden of the child's illness on the family. The family impact scale consists of four subtitles, which measure the family's level of influence: financial support, general impact, deterioration in social relations and coping, and a total effect that includes all sub-headings. In the scale, families were asked to give appropriate answers such as 'totally agree 1, 'agree 2, 'disagree 3, and disagree 4. The scale has a Likert type assessment ranging from 1 to 4. A minimum of 24 and a maximum of 96 points can be obtained on the scale (Stein and Riessman, 1980).

Short Form-36 (SF-36)

The quality of life of mothers and fathers was evaluated with the Short Form-36 (SF-36). The SF-36 questionnaire is a valid and frequently used criterion for assessing the quality of life. It includes 36 questions on eight subscales of physical function, physical role restriction, emotional role restriction, body pain, mental health, vitality, social function, and general health. There are two subsections of the Physical Component Scale (PCS) and the Mental Component Scale (MCS). The physical section summary scale; physical function, body pain, physical role, and general health subscales; the mental section summary scale consists of vitality, emotional role, social function, and mental health subscales (Ware and Sherbourne, 1992).

Statistical Analysis

IBM SPSS Statistics 22 program was used for the statistical analysis (IBM Corp., New York, USA). Pearson correlation test was used in correlation. The normal distribution of the data was evaluated with the Kolmogorov Smirnov test. The datas were suitable for normal distribution. Independent samples t test was used to compare two independent groups. In statistical analysis, $p \leq 0.05$ was set as statistical significance.

RESULTS

Demographic and clinical information of children and parents are shown in the first table (Table 1). The study was carried out on 49 children (mean age: 8.45 ± 4.74 years) with CP, 24 mothers (age: 40.05 ± 7.79) and 25 fathers (mean age: age: 43.25 ± 6.85 years).

Table 1. Demographical and clinical information of children and parents

Variable	Group	Mean ± SD
Height	Child	125,69±27,57
Weight	Child	26,40±13,32
Age	Child	8,45±4.74
	Mother	40,05±7,79
	Father	43,25±6,85
Gender	Male	25 (%51)
	Female	24 (%49)
Weefim Groups	CNO	34 (%69.4)
	IC	15 (%30.6)

CNO: children who need observation IC: Indipendent children SD: Standart Deviation

There was no difference between mothers and fathers within IFS and SF-36 scores that CNO (IFS: p=0.52; SF-36: p=0,59) and IC groups (IFS: p=0.54;SF-36: p=0,06) (Table 2). When the IFS and SF-36 scores were compared according to the functional level of the children within mothers (IFS: p=0.31;SF-36: p=0,22) and fathers (IFS: p=0.43;SF-36: p=0,52), no difference was found (Table 3). No relationship was found between the level of influence of mothers and fathers with children with cerebral palsy and the functional level of their children (Table 4).

Table 2. Comparison of parents' IFS scores within and between groups

	CNO (n=34)	IC (n=15)	
Variables	Mean (Min-Max)	Mean (Min-Max)	p*
Total IFS score mothers	45,6 (21 - 90)	49,6 (30 - 76)	0,310
Total IFS score fathers	42,8 (24 - 64)	46,5 (33 - 72)	0,430
p**	0,525	0,547	

CNO: children who need observation IC: Indipendent children IFS: Impact of Family Scale Min: Minimum, Max: Maximum p*:comparison IFS scores of CNO and IC groups within mothers and fathers, p**: comparison of mothers and fathers IFS scores of CNO and IC group

Table 3. Comparison of parents' SF-36 scores within and between groups

Variables	CNO (n=34) Mean (Min-Max)	IC (n=15) Mean (Min-Max)	p*
Total SF-36 score mothers	67 (37,2 - 93,9)	71,8 (44,2 - 92,4)	0,225
Total SF-36 score fathers	73,2 (41,4 - 95,1)	75,1 (41,7 - 96,7)	0,523
p**	0,590	0,061	

CNO: children who need observation, IC: Indipendent children, Min: Minimum, Max: Maximum, p*: comparison SF-36 scores of CNO and IC groups within mothers and fathers, p**: comparison of mothers and fathers SF-36 scores of CNO and IC group

Table 4. Correlation between groups within mothers and fathers in IFS and SF-36 scores

		CNO (n=34)	IC (n=15)
Total IFS score mothers	**r**	-0,046	0,207
	p	0,795	0,519
Total IFS score fathers	**r**	0,152	0,294
	p	0,389	0,354
Total SF-36 score mothers	**r**	-0,016	0,018
	p	0,928	0,957
Total SF-36 score fathers	**r**	-0,059	-0,151
	p	0,738	0,639

CNO: children who need observation IC: Indipendent children IFS: Impact of Family Scale

There was a positive correlation between mothers and fathers IFS scores in CNO (r=0,39; p=0,02) and IC group (r=0,60; p=0,03). SF-36 scores in CNO (r=0,54; p=0,00) and IC (r=0,82; p=0,00) group had a positive correlation between the of mothers and fathers (Table 5). When the levels of influence and quality of life of the mothers and fathers within the groups were compared, it was observed that there was no significant difference between the mothers and fathers in the group CNO and in the IC group (p>0.05).

Table 5. Correlation between IFS, SF-36 scores of mothers and fathers within groups

		CNO(n=34)	IC(n=15)
Total IFS score mother/father	r	0,394*	0,602*
	p	0,021	0,038
Total SF-36 score mother/father	r	0,546*	0,825*
	p	0,001	0,001

CNO: children who need observation IC: Indipendent children IFS: Impact of Family Scale

DISCUSSION

This study was planned to reveal how the functional levels of children with cerebral palsy in the northern part of Cyprus affect the mother and father, how it changes the quality of life of the family, and whether there is a difference between the influence of the mother and father.

In the literature, there are studies showing that the functional level of the child with CP is not as affected as the studies showing that it affects the life parameters of the family (Ramanandi et al., 2019). In the study of Rodrigues et al. examining the relationship between the functional status of children with CP and the quality of life of the first-degree caregivers, it was observed that the relationship between WeeFIM and SF-36 total scores was positive, and there was a negative effect on the quality of life of caregivers (Rodrigues dos Santos, 2009). It was stated that the effect was due to problems related to physical, behavioral, psychological and social functioning. In Turkey Albayrak et al. found that mothers with children with CP had higher caregiving burden, depression scores, and poorer sleep and life quality compared to mothers with healthy children (Albayrak et al., 2019). It was stated that this result was most likely due to mothers providing home care for their children with CP all day long and being exposed to long-term stress factors. They were evaluated the quality of life of mothers with 424 children with CP and their children's motor levels in Iran. As a result, they stated that children with worse gross motor function need more support and this support may cause injuries to the musculoskeletal system of the mother. Thus, in general, they suggested that if the gross motor functions of children with CP are at low levels, the physical health of mothers might also be negatively affected (Dehghan et al., 2016). Contrary to these studies, Davis et al. examined the quality of life of mothers and fathers with children with CP, and it was found that the functional level of the child did not make a significant difference in financial, social and physical issues, including parental stress (Davis et al., 2010). Riberio et al. in their study conducted in Brazil, they compared the stress of mothers with children with CP and their functional level classified according to GMFCS, but it was observed that the deterioration of the functional level of the child with CP did not increase the mother's stress (Riberio et al., 2014).

In the study, they argued that the deterioration in the health and quality of life of mothers depends on how the family copes with adverse situations and how they organize themselves against their children's illness rather than the child's level of disability. In a study conducted in Korea, determinants affecting health-related quality of life in parents were examined and it was found that the severity of disability was not an important quality of life determinant for mothers of children with CP. In the study, the physical quality of life of the child to have less secondary diseases; On the other hand, it was stated that social support and having sufficient free time of the mother increased the mental life quality (Lee et al., 2019). In a similar study involving 270 children with CP, IFSs were administered to mothers without including the questions of the coping domain to evaluate the disease status, and as a result, none of the IFS factors laid the groundwork for a significant relationship between the functional status of the children and the depression of the mothers. It has been reported that only the lack of perceived social support has an important role in the relationship between the functional status of the child and maternal depression (Manuel et al., 2003). In our study, no relationship was found between the WeeFIM score of the children and the IFS total effect scores of the parents and the SF-36 Form mean scores. This is a case consistent with social comparison theory. Parents of children with mild disabilities think

their quality of life is good when they compare themselves with the parents of severely disabled children. Because comparing oneself with the less fortunate is common among individuals with disabled children. In this regard, we need to mention the following point: The North of Cyprus is a geography where both broad and nuclear family relations are tight. Even after marriage, it is very common for families to provide financial and moral support to their children, care for grandchildren, and help with household chores. In this sense, the social support provided by other members of the family to the parents of children with CP in Northern Cyprus helps both to reduce the burden on the child and to provide time for the family. This is the biggest reason why families are less affected by this situation.

In the literature, there are quite a few studies comparing the changing quality of life and exposure levels of mothers and fathers due to having children with CP (Barreto et al., 2020). Parisi et al. applied a scale to parents of children with cerebral palsy to determine how much this disease affected them in Italy (Parisi et al., 2016). It was observed that mothers got higher scores than the father group in subscales related to the influence of the sick child and the family life and other family members due to the disease.

Pelchat et al. in the evaluation of 13 couples with children with CP, investigated the adaptation and transformation processes of parents in their personal, marital and parenting roles and drew attention to the differences and similarities between them in these processes (Pelchat et al., 2009). While mothers were more inclined to reveal their feelings to cope with this situation and sought both social and informative support, fathers often showed emotional reactions such as avoidance and denial to distance themselves from the situation emotionally. In our study, the mothers, and fathers of children with "requiring observation" and "independent" CP were compared among themselves, and the quality of life and impact scores of the mothers did not differ significantly compared to the fathers. This shows that the parents shared similar experiences and faced similar difficulties. There are no serious differences between mother and father's burden distribution in family structures in Northern Cyprus. Fathers also play an active role in childcare throughout the island of Cyprus, although mothers have slightly more responsibilities for the child, as they are generally primary caregivers. Thus, the mother and father share the responsibility equally in the house. This situation explains why there is no difference between mother and father's quality of life and levels of influence.

Our study had some limitations. First, there was no control group in this study. Future studies should include a control group of parents with healthy children to allow comparisons of quality of life and levels of influence between groups. Second, there is a need for establishing causal relationships of the results and longitudinal studies that examine the changes in the physical and mental quality of life of the parents over time. Finally, the data we obtained has led us to the impression that families in small communities do not want their children with disabilities to appear as a burden on them. In such a situation, we think that the environment will misunderstand families; they will be thought to be dislike their children when they give negative answers, and they may be worried about social stigma and avoid objectively answering questions.

As a result, we have seen that due to the Mediterranean climate of Northern Cyprus, the low population, and the presence of close family and social relations, families with children with CP are not affected as much as parents in other countries. Our study supports the clinical necessity of family / patient-centered biopsychosocial approach. We believe that providing environmental, social and physical support to families can help their children minimize the impact of their illness on their lives and change the health outcomes of the caregiver. For this reason, we consider and recommend that it is important and necessary to provide all kinds of support to families with disabled children in state policies.

Acknowledment

The authors thank all the students who participated in this study.

Conflict of interests

The authors have no conflict of interests to declare. No financial support was received for this study

Ethical Consideration

The study protocol was carried out in accordance with the Helsinki Declaration of 1975 and an approval was obtained from the University of Near East, Scientific Research Ethics Committee, Cyprus (Ref: YDU/2017/44-370).

Written informed consent forms were obtained from all participants prior to the study.

Author Contributions

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

REFERENCES

Akmeşe, P., Mutlu, A., Günel, M.K. (2007). Investigation of anxiety levels of mothers of children with cerebral palsy. *Journal of Child Health and Diseases;* 50 (4): 236–240.

Albayrak, I., Biber, A., Çalışkan, A., Levendoğlu, F. (2019). Assessment of pain, care burden, depression level, sleep quality, fatigue and quality of life in the mothers of children with cerebral palsy. *J Child Health Care*; 23(3): 483-494.

Al-Gamal, E., Long, T. (2013). Psychological distress and perceived support among Jordanian parents living with a child with cerebral palsy: a cross-sectional study. *Scand J Caring Sci*; 27(3): 624-31.

Barreto, T.M., Bento, M.N., Barreto, T.M., Jagersbacher, J.G., Jones, N.S., Lucena, R., et al. (2020). Prevalence of depression, anxiety, and substance-related disorders in parents of children with cerebral palsy: a systematic review. *Dev Med Child Neurol*; 62(2): 163-168.

Çetin, S.Y., Calık, B.B., Taşpınar, F., Aslan, U.B. (2017). The effect of functional independence level and age's on the quality of life of mother's with down syndrome children. *Curr Pediatr Res*; 21(4): 652-657.

Davis, E., Shelly, A., Waters, E., Boyd, R., Cook, K., Davern, M., et al. (2010). The impact of caring for a child with cerebral palsy: quality of life for mothers and fathers. *Child Care Health Dev*; 36(1): 63-73.

Dehghan, L., Dalvand, H., Feizi, A., Samadi, S.A., Hosseini. S.A. (2016). Quality of life in mothers of children with cerebral palsy: The role of children's gross motor function. *J Child Health Care*; 20(1): 17-26.

Glinac, A., Matović, L., Delalić, A., Mešalić, L. (2017). Quality of Life in Mothers of Children with Cerebral Palsy. *Acta Clin Croat*; 56(2): 299-307.

Lee, M.H., Matthews, A.K., Park, C. (2019). Determinants of Health-related Quality of Life Among Mothers of Children with Cerebral Palsy. *J Pediatr Nurs*; 44: 1-8.

Manuel, J., Naughton, M.J., Balkrishnan, R., Paterson Smith, B., Koman, L.A. (2003). Stress and adaptation in mothers of children with cerebral palsy. *J Pediatr Psychol*; 28(3): 197-201.

Msall, M.E., DiGaudio, K., Rogers, B.T., LaForest, S., Catanzaro, N.L., Campbell, J, et al. (1994). The Functional Independence Measure for Children (WeeFIM). Conceptual basis and pilot use in children with developmental disabilities. *Clin Pediatr (Phila)*; 33(7): 421-30.

Olawale, O.A., Deih, A.N., Yaadar, R.K. (2013). Psychological impact of cerebral palsy on families: The African perspective. *J Neurosci Rural Pract*; 4(2):159-63.

Panteliadis, C.P. (2004). *Serebral Palsi*. Ankara: Pelikan Yayınları. ISBN: 978-605-64741-9-4

Parisi, L., Ruberto, M., Precenzano, F., Di Filippo, T., Russotto, C., Maltese, A., et al. (2016). The quality of life in children with cerebral palsy. *Acta Medica Mediterr*; *32*: 1665.

Parkes, J., Caravale, B., Marcelli, M., Franco, F., Colver, A. (2011). Parenting stress and children with cerebral palsy: a European cross-sectional survey. *Dev Med Child Neurol*; 53(9): 815-821.

Pelchat, D., Levert, M.J., Bourgeois-Guérin, V. (2009). How do mothers and fathers who have a child with a disability describe their adaptation/ transformation process? *J Child Health Care*; 13(3): 239-59.

Raina, P., O'Donnell, M., Rosenbaum, P., Brehaut, J., Walter, S.D., Russell, D., et al. (2005). The health and well-being of caregivers of children with cerebral palsy. *Pediatrics*; 115(6): e626-36.

Ramanandi, D., Parmar, D., Panchal, D., Prabhakar, D. (2019). Impact of Parenting a Child with Cerebral Palsy on the Quality of Life of Parents: A Systematic Review of Literature. *Disability, CBR & Inclusive Development*; 30(1), 57-93.

Ribeiro, M.F., Sousa, A.L., Vandenberghe, L., Porto, C.C. (2014). Parental stress in mothers of children and adolescents with

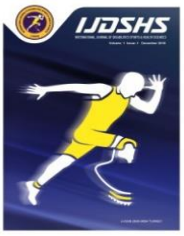
cerebral palsy. *Rev Lat Am Enfermagem*; 22(3): 440-7.

Rodrigues dos Santos, M.T., Bianccardi, M., Celiberti, P., de Oliveira Guaré, R. (2009). Dental caries in cerebral palsied individuals and their caregivers' quality of life. *Child Care Health Dev*; 35(4): 475-81.

Stein, R.E., Riessman, C.K. (1980). The development of an impact-on-family scale: preliminary findings. *Med Care*; 18(4): 465-72.

Ware, J.E., Jr, Sherbourne, C.D. (1992). The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care*; 30(6): 473-83.

How to cite this article: Bağkur, M., Yerlikaya, T., Başakçı Çalık, B. and Cavlak, U. (2022). Investigation of the Effect of Functional Levels of Children with Cerebral Palsy on Parents' Quality of Life in Northern Cyprus. *Int J Disabil Sports Health Sci*;5(1):22-29. https://doi.org/ 10.33438 /ijdshs. 1077248.



International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

RESEARCH ARTICLE

Determination of Factors Inhibiting the Physıcal Activity Status of Nursing Students in the Covid-19 Pandemic

Tuba BÜLBÜL[1], Betül TOSUN [2] and Ezgi DİRGAR[3*]

[1]Hasan Kalyoncu Üniversite, Faculty of Healht Science, Nursing Departmant, Gaziantep, Turkey
[2] Hasan Kalyoncu Üniversite, Faculty of Healht Science, Nursing Departmant, Gaziantep, Turkey
[3]Hasan Kalyoncu Üniversite, Faculty of Healht Science, Nursing Departmant, Gaziantep, Turkey
*Corresponding author: ezgi.dirgar@hku.edu.tr

Abstract

The COVID-19 pandemic, which is accepted as a pandemic by the World Health Organization, has seriously affected life in our country as well as all over the world. Quarantine decisions taken to control the spread of the pandemic caused physical inactivity in people. Especially in the student years, if no direction or intervention is made for insufficient physical activity, it can have negative effects on the health of individuals in the following years. The study, which was designed in descriptive type, was conducted with 261 volunteer students between February and March 2021 in order to determine the factors that prevent the physical activity status of nursing students during the pandemic period. The data were collected online with a questionnaire in which the demographic information and physical activity levels of the participants were questioned, and the 'Physical Activity Barriers Scale' (PABS). Data were given together as number, percentage, median, mean standard deviation, and $p<0.05$ was accepted as statistical significance level in all statistics. It was found that the mean age of the students was 21.36±1.58, 80.8% were female, 78.2% did not do physical activity, and 47.5% gained weight during this period. The total score they got from PABS was 54.47±13.13. During this period, the students living in the village, having low income and gaining weight had higher PABS scores ($p = 0.05$). It is recommended that these students, who will serve in the field of health, be given self-skill training that they should not neglect physical activity even if their conditions change.

Keywords
Covid-19, Pandemic, Physical İnactivity, Nursing Students

INTRODUCTION

Physical inactivity is defined as 'being below the level of physical activity required to maintain a healthy life and prevent premature deaths' (Özdemir, 2020). Physical inactivity ranks fourth in the list of risk factors that cause death, accounting for 6% of deaths worldwide (Ercan and Keklicek, 2020; General Directorate of Public Health, 2021). Quarantine decisions taken to control the Covid-19 pandemic, which has affected the whole world, have caused physical inactivity in people. In our society, which does not have the habit of exercising as a result of the measures taken, individuals have lost their physical activities in their daily habits, and therefore physical inactivity has reached a high level (Ercan and Keklicek, 2020; Turan et al., 2014).

There is evidence in the literature that physical activity reduces the risk of premature death due to cardiovascular disease, protects against type 2 diabetes, facilitates glucose balance, reduces the risk of obesity by providing energy expenditure and balance, protects bone health by preventing osteoporosis, and especially reduces the incidence of breast and colon cancer (Alpözgen and Özdinçerler, 2016; Warburton et al., 2006; Lee et al., 2016; Kodama et al., 2013). At the same

Received: 21 February 2022 ; **Accepted:** 14 May 2022 ; **Published:** 20 June 2022
[1]**ORCID**: 0000-0002-4694-4758, [2]**ORCID:** 0000-0002-4505-5887, [3]**ORCID:** 0000-0001-8214-7441

time, it is supported by studies that physical activity increases the quality of life, reduces the symptoms of depression and anxiety, that the individual should be encouraged to exercise regularly together with pharmacological treatments, and has positive effects on developing self-confidence in social relationships (Can et al., 2014). Okuyan et al. (2020) found in their study that nursing students were negatively affected by spending time at home due to the pandemic, and they felt overwhelmed and nervous. In line with these data, they concluded that it would be beneficial to increase their self-confidence for their thoughts on the future nursing profession. In their study, Yanık and Yeşilçınar (2021) concluded that nursing students were insufficient in coping with stress during the social isolation process and they experienced stress due to financial inadequacy. In addition, they reported that they could spare enough time for themselves and their hobbies, and their motivation increased. Ercan and Keklicek (2020) found in their study that during the Covid-19 period, the rate of regular physical activity of nursing students decreased, and at the same time, the rate of general physical inactivity increased.

Covid-19, which affects the whole world, has limited our activities. Due to the prolongation of the pandemic process and the increase in the measures taken, physical inactivity is also increasing. This study was planned with the aim of "Determining the Factors that Prevent the Physical Activity Status of Nursing Students in the Covid-19 Pandemic".

MATERIALS AND METHODS

Desing

The research was designed and implemented in a descriptive type by including nursing students who voluntarily agreed to participate in the research via the online form between February and March 2021 at a foundation university in the Southeastern Anatolia Region. Approval was obtained from the Non-Invasive Ethics Committee (2021/007, 19.01.2021) of the Faculty of Health Sciences of Hasan Kalyoncu University for the implementation of the study.

Sample

The sample of this study consists of 261 nursing students from Hasan Kalyoncu University Faculty of Health Sciences who volunteered to participate in the study.

Instruments

Necessary permission was obtained from the scale owner for the right to use the “Physical Activity Disability Scale” in the second part of the data collection section of the study. In data collection, nursing students' information questionnaire and "Physical Activity Barriers Scale (PABQ)" (Yurtçiçek et al., 2018) were used to measure physical activity barriers. Scale; It is prepared in a 5-point likert type and is evaluated as 5 points, I strongly agree, 4 points, I am undecided, 3 points, I disagree 2 points, and I strongly disagree 1 point. The scale consists of 3 sub-dimensions and a total of 22 statements. Scale; It consists of three sub-dimensions: Personal (14 items), Social Environment (3 items) and Physical Environment (5 items). High scores on the scale mean that the probability of creating an obstacle is high. The Cronbach's alpha reliability coefficient was found to be 0.87, and the Cronbach's alpha reliability coefficients for the sub-dimensions of the scale were found to be between 0.53 and 0.85.

Data Analysis

For the analysis of the data of this study SPSS (Statistical Package for Social Science for Windows) 25 package program as used. Socio-demographic characteristics and physical activity status of nursing students participating in the research; It was evaluated whether there was a significant difference between gender, place of residence, class level, income level, education level, physical activity status, weight change and the average scores they got from the Physical Activity Disability Scale. Descriptive statistics were given as number, percentage (%), mean±standard deviation. Since the variances did not show homogeneous and normal distribution, the "Mann-Whitney U Test" was used instead of the "Student t-Test" for the comparison of continuous numerical variables for the analysis, and the "Kruskal-Wallis H-Test" was used instead of the "One Way ANOVA" test for the comparison of more than two groups. The $p<0.05$ level was considered statistically significant in statistical decisions. Pearson Correlation Analysis was used based on the normal distribution of data. Within the scope of the research, answers to the following questions were sought;

a. What are the physical activity levels of nursing students during the Covid-19 pandemic period?

b. What are the factors that prevent the physical activity levels of nursing students during the Covid-19 pandemic period?
c. What is the relationship between BMI, age, scale sub-dimensions and total scale scores of nursing students during the Covid-19 pandemic period?

RESULTS

In this study, the socio-demographic characteristics of the nursing students participating in the research are given in Table 1. 80.8% of the students are women and 74.4% are between the ages of 20-22. 68.2% of nursing students live in the province and 23% live in the district. 32.2% of the students are 1st grade, 30.7% 3rd class 27.6% 2nd class and 9.6% 4th class. In this study, the income of 69.3% of the nursing students was found to be equal to the expenditure. Students 35.2% of the stated that they went out once a week, 23.4% of them stated that they went out more than 3 times a week. Those who did physical activity were determined as 21.8%. Students who experienced weight change during the pandemic process were determined as 73.6%. It was determined that 47.5% of the nursing students who experienced weight change gained weight. It was determined that 5.7% of the nursing students had chronic diseases, 13.8% smoked, 4.6% used alcohol and 1.9% used psychiatric drugs.

Table 1. Socio-demographical characteristics of nursing students (n=261)

Demographic features	**Mean±SD**	
Years	21.36±1.58	
	n /	**%**
Gender		
Woman	211	80.8
Male	50	19.2
Place of Residence		
Province	178	68.2
District	60	23.0
Town	4	1.5
Village	19	7.3
Class Level		
1st Class	84	32.2
2nd Class	72	27.6
3rd Class	80	30.7
4th Class	25	9.6
Income Rate		
Income less than expenses	38	14.6
Income equals expenses	181	69.3
Income more than expenses	42	16.1
Number of Going Out per Week		
1	92	35.2
2	58	22.2
3	50	19.2
More than 3	61	23.4
Physical Activity Status		
Yes	57	21.8
No	204	78.2
Weight Change		
Yes	192	73.6
No	69	26.4

Table 1. Continue

Demographic features	Mean±SD	
Years	21.36±1.58	
	n /	**%**
Weight Change Status		
I lose weight	68	26.1
I got weight	124	47.5
Chronic Disease		
Yes	15	5.7
No	246	94.3
Smoking		
Yes	36	13.8
No	225	86.2
Alcohol Use		
Yes	12	4.6
No	249	95.4
Psychiatric Drug Use		
Yes	5	1.9
No	256	98.1

The total score the students got from the Physical Activity Disability Scale was 54.47±13.13 (Table 2). As a result of the comparison of the variables of gender, place of residence and presence of chronic disease of the nursing students, it was determined that there was no statistical significance (Table 3). As a result of the comparison of the income and class level variables, a statistically significant difference was found between the physical environment sub-dimension ($p < 0.005$) and the total scale score ($p < 0.05$) averages. No difference was found among the other sub-themes.

Table 2. The average scores of the total and sub-dimensions of the nursing students from the scale (n=261)

Physical Activity Barriers Scale and Sub-Dimensions	Mean ± SD	Min.- Max.
Personal	33.12±8.31	14-59
Social Environment	7.86±2.74	3-15
Physically Environment	13.49±4.23	5-25
Total Scale	54.47±13.13	22-88

In Table 4. a simple correlation analysis of the significant relationship between the age, bki and scale sub-dimensions of nursing students was performed. A positive and significant relationship was found between age and BMI. A positive and significant relationship was determined between the social environment sub-dimension and BMI ($r = 0.212$, $p = 0.001$), years ($r = 0.131$, $p = 0.035$), and personal sub-dimension ($r = 0548$, $p = .000$). A positive and significant relationship was found between the physical environment sub-dimension and age, personal sub-dimension and social environment sub-dimension. A positive and significant relationship was found between the total scale and the sub-dimensions of personal, social and physical environment.

Table 3. Distribution and comparison of nursing students' scale sub-dimension and total scale scores according to socio-demographic characteristics (n=261)

Socio-Demographic Characteristics	Personel Environment	Social Environment	Physically Environment	Total Scale
Gender				
Woman	MW=5107.00	MW=5199.00	MW=4648.50	MW=5077.50
Male	p=0.726	p=0.873	p=0.190	p=0.681
Where he lives				
Province				
District	$\chi 2$ =0.268	$\chi 2$ =5.254	$\chi 2$ =5.476	$\chi 2$ =1.601
Town	p=0.875	p=0.072	p=0.065	p=0.449
Village				
Income rate				
Income less than expenses	$\chi 2$=3.881	$\chi 2$=1.051	$\chi 2$=22.212	$\chi 2$=6.145
Income equals expence	p=0.144	p=0.591	**p=0.000****	**p=0.046***
Income more than expenses				
Chronic Disease				
Yes	MW=1352.50	MW=1733.50	MW=1688.50	MW=1622.50
No	p=0.082	p=0.692	p=0.580	p=0.433
Class Level				
1st Class				
2nd Class	$\chi 2$=7.254	$\chi 2$=5.241	$\chi 2$=14.281	$\chi 2$=11.420
3rd Class	p=0.064	p=0.155	**p=0.003****	**p=0.010***
4th Class				

*p < 0.05 **p < 0.005 , **$\chi 2$** : Kruskall –Wallis –H testi, **MW**: Mann-Whitney-U Testi

Table 4. Simple correlation analysis between years, bmi and scale sub-dimensions of nursing students (n=261)

Variable	*n*	*M*	*SD*	1	2	3	4	5	6
1.BMI	261	0.07	1.24	-	0.158*	0.012	0.212**	0.064	0.074
2.Years	261	21.36	1.58		-	0.042	0.131*	0.047	0.016
3.Personal	261	33.12	8.31			-	0.548**	0.555**	0.927**
4.Social Environment	261	7.86	2.74				-	0.584**	0.745**
5.Physically Environment	261	13.49	4.23					-	0.796**
6.Total Scale	261	54.47	13.13						-

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

DISCUSSION

In this study, the relationship between the factors that prevent the physical activity status of nursing students and their socio-demographic characteristics during the pandemic period was discussed according to the literature. It was determined that the personal sub-dimension, one of the sub-dimensions of the scale, constituted an obstacle to physical activity. In the answers given by the students to the items in the personal sub-dimension of the scale, it was concluded that they did not have enough energy for physical activity, the activity was difficult and tiring, they were afraid of being injured, and they could not maintain their self-discipline. Yao et al. (2021), Ibrahim et al. (2013) support the findings of their research.

In the study, it was determined that there was no statistical significance as a result of the comparison of the sub-dimensions of the physical activity barriers scale and the total scale score averages and the gender of the nursing students. Sarol (2017), Blake et al. (2016) found that there was no significant difference between the genders as a result of their research. The findings are in line with the research findings. Serrano et al. (2017), Sabharwal (2018), Martínez-Lemos et al. (2014) determined that there is a statistically significant difference between physical activity disabilities and gender. Sabharwal (2018) stated in their research that men are more encouraged to engage in physical activity, and this is due to cultural differences.

It was determined that the income and class levels of the nursing students were the factors that

hindered their activities due to the physical environment sub-dimension ($p<0.05$). The difference in these factors is due to the fact that nursing students whose income is less than their expenses and those who are in the 3rd grade do less physical activity. In their research, Akyol and Akkaşoğlu (2020) determined that 1st year students are an obstacle to participating in leisure activities due to lack of transportation and finance. In the comparison made according to the variable of income status, which is also in line with the research of Akyol and Akkaşoğlu (2020), it has been determined that the students whose monthly income is below the minimum wage constitute an obstacle to participation in leisure activities. In our study, a similarity was found between the physical environment sub-dimension items and the findings obtained in the study.

When the research findings are examined; As a result of the comparison of the variable of income levels of nursing students, a statistically significant difference was found between the physical environment sub-dimension and the total scale score averages. In the study of Ibrahim et al.(2013), it was determined that the monthly income level variable and the physical environment sub-dimension were the determining factors. As a result of this similarity; that people's physical activities are related to their income levels, due to lack of financial means; It was determined that the lack of facilities, transportation means, sports equipment/clothing and lack of skills constitute an obstacle to physical activity. Martínez-Lemos et al.(2014) concluded in their study that income levels will prevent individuals from doing physical activity.

As a result of the comparison of the sub-dimensions and total scale mean scores of the physical activity barriers scale and the grade levels of the nursing students, a statistically significant difference was found between the physical environment sub-dimension and the total scale mean score. Akyol and Akkaşoğlu (2020), it was determined in their research that 1st grade students are an obstacle to participating in physical activity activities due to lack of transportation and finance. Findings from this study show parallelism.

CONCLUSION

As a result; In the Covid-19 pandemic, the factors that prevent the physical activity level and physical activity status of nursing students were determined. It was determined that 78.2% of nursing students did not do physical activity during the Covid-19 pandemic. It has been determined that the gender, place of residence and chronic diseases of nursing students do not prevent them from doing physical activity during the Covid-19 pandemic process. It was determined that the income and class levels of the nursing students were the factors that hindered their physical activity ($p<0.05$).

Participation in physical activity with various activities reduces the risk of many chronic diseases, increases the quality of life and contributes to mental health. It is recommended that these students, who will serve in the field of health, to reduce the increased physical inactivity due to the Covid-19 pandemic, should be given self-skill training that they should not neglect physical activity even if their conditions change. At the university; Programs that will encourage students to engage in physical activity and increase their motivation should be organized in the campus area, within the faculty. In order to adopt physical activity as a lifestyle, public health action should be taken.

Acknowledment

The authors thank all the students who participated in this study.

Conflict of interests

The authors have no conflict of interests to declare. No financial support was received for this study

Ethical Consideration

The study protocol was carried out in accordance with the Helsinki Declaration of 1975 and an approval was obtained from the Faculty of Health Sciences of Hasan Kalyoncu University, Non-Invasive Ethics Committee (Ref: 2021/007, 19.01.2021). Written informed consent forms were obtained from all participants prior to the study.

Author Contributions

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

REFERENCES

Akyol, C., Akkaşoğlu, S. (2020). A research on the obstacles for participations in recreation activities of youth in leisure time. *Journal of*

Tourism and Gastronomy Studies, *8*(3), 2072-2089.

Alpözgen, A.Z., Özdinçeler, A.R. (2016). Physical activity and its protective effects: review. *Journal of Health Sciences and Professions.* 3(1), 66-72.

Barkley, J.E., Lepp, A., Glickma, E., Farnell G., Beiting J., Wiet R., Dowdell B. (2020). The acute effects of the COVID-19 pandemic on physical activity and sedentary behavior in university students and employees. *International journal of exercise science*, *13*(5), 1326.

Blake, H., Stanulewicz, N., Mcgill, F. (2017). Predictors of physical activity and barriers to exercise in nursing and medical students. *Journal of Advanced Nursi'n*, *73*(4), 917-929.

Can, S., Arslan, E., Ersöz, G. (2014). Current perspectıves on physıcal actıvıty. *Spormetre Journal of Physical Education and Sport Sciences*, 12(1), 1-10.

Caner, Z.G., Ünal, M., Apaydın, Z., Dağ, A., Okur, Ş., Kara, E., Bildik, C. (2020). Covid-19 Disease and The Importance Of Home Exercises. *Journal of Medical Secince*, *1*(3), 25-33.

Ercan, S., Keklicek, H. (2020). Investigation of the change in physical activity levels of university students due to COVID-19 pandemic. *Izmir Kâtip Celebi University Faculty of Health Sciences Journal*. 5(2), 69-74.

Ibrahim, S., Karim, N.A., Oon, N.L., Ngah, W.Z.W. 2013. Perceived physical activity barriers related to body weight status and sociodemographic factors among malaysian men in klang valley. *BMC public health*, *13*(1), 1-10.

İnal, Ö., Tunçer, B. 2020. Investigation of motivation for participation in physical activity and barriers in young adults. *Hacettepe University Faculty of Health Sciences Journal*, *7*(3), 260-270.

Kartal, A., Ergin, E., Kanmış, H. D. (2020). Suggestions about healthy nutrition and physical fitness exercise during covıd-19 pandemic. *Eurasıan Journal of Health Scıences*, 149-155.

Martínez-Lemos, R. I., Puig Ribera, A., García-García, O. (2014). Perceived barriers to physical activity and related factors in Spanish university students. *Open Journal of Preventive Medicine*. 4, 164-174.

Özdemir, O. (2020). Physical inactivity. Kutsal Y., Aslan D. (Ed.). *Approach to the advanced age group in the covid 19 pandemic process.* Ankara: Hangar Brand Communications Advertising Services Publisher. 25-31.

Öztürk, O., Bayraktar, D. (2020). In the dawn of the pandemics: covıd-19 and physical ınactivity. *Izmir Katip Celebi University Faculty of Health Sciences Journal*. 5(2), 143-146.

Sabharwal, M. (2018). Perceived barriers of young adults for participation in physical activity. *Current Research in Nutrition and Food Science Journal*, *6*(2), 437-449.

Sarol, H. (2017). Examination of the constraints and facilitators to physical activity participation of individuals. *Journal of Human Secince*, *14*(4), 4354-4364.

Sevil Serrano, J., Práxedes Pizarro, A., Zaragoza Casterad, J., del Villar Álvarez, F., García-González, L. (2017). Perceived barriers to physical activity in university students. Differences in gender and physical activity levels. *Universitas Psychologica*, *16*(4), 303-317.

T.C. Ministry of Health. Covid-19 Information Platform. https://covid19.saglik.gov.tr/TR-66300/covid-19-nedir-.html [02/11/2021]

T.C. Ministry of Health. Public Health Directorate General.https://hsgm.saglik.gov.tr/tr/fiziksel-aktivite/ulkemizde-durum.html[15/01/2021].

Turan, A., Akı, E., Bumin, G. (2014). Demirel H., Kayıhan H., Özmert E., Doğan A. (Ed.). *Turkey physical activity directory.* Ankara: Kuban Printing Publishing.

Yao, L.E., Vasanthi, R.K., Praveen, R., Nadzalan A.M., Surendran P.J. (2021). Perceived barriers to physical activity among Malaysian adults during COVID-19 pandemic-a cross-sectional study. *Revista Pesquisa em Fisioterapia*, *11*(4), 702-710.

Yıldırım, M., Bayrak, C. (2017). Determınatıon of partıcıpatıon levels of physıcal actıvıtıes of unıversıty students accordıng to demographıc characterıstıcs (sample of Eskişehir Osmangazi Unıversıty). *The Journal of Academic Social Science. 5*(54), 310-330.

Yurtçiçek, S, Şahin, N.H, Miral, M., (2018). The study of the valıdıty and relıabılıty of the

turkısh versıon of physıcal actıvıty barrıers questıonnaıre. *The Journal of Academic Social Science*, *6*(71), 396-404.

WHO (World Halt Organization). https:// covid19. who.int/table [15/11/2021].

Warburton, D.E., Nicol, C.W., Bredin, S.S. (2006). Health benefits of physical activity: the evidence. *Cmaj*, *174*(6), 801-809.

Lee, G., Choi, H.Y., Yang, S.J. (2015). Effects of dietary and physical activity interventions on metabolic syndrome: A meta-analysis. *Journal of Korean Academy of Nursing*, *45*(4), 483-494.

Kodama, S., Tanaka, S., Heianza, Y., Fujihara, K., Horikawa, C., Shimano, H., ... & Sone, H. (2013). Association between physical activity and risk of all-cause mortality and cardiovascular disease in patients with diabetes: a meta-analysis. *Diabetes Care*, *36*(2), 471-479.

How to cite this article:
Bülbül, T., Tosun, B and Dirgar, E. (2022). Determination of Factors Inhibiting the Physıcal Activity Status of Nursing Students in the Covid-19 Pandemic. *Int J Disabil Sports Health Sci*;5(1):30-37.https://doi.org/ 10.33438 /ijdshs.1071378

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

RESEARCH ARTICLE

The Effectiveness of Calistenic Exercise Training in Adolescents Receiving Online Education During COVID-19 Pandemic

Kemal ALTUNTAŞ*[1], Nihan ÖZÜNLÜ PEKYAVAŞ[2], Oya ÜMİT YEMİŞÇİ[3] and Halime Ceren TEZEREN[4]

[1]Baskent University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Ankara/Turkey
[2]Baskent University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Ankara/Turkey
[3]Baskent University, Faculty of Medicine, Department of Physical Therapy and Rehabilitation, Ankara/Turkey
[4]Baskent University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Ankara/Turkey
*Corresponding author: kemalaltuntas96@hotmail.com

Abstract

Background: During the Covid-19 pandemic, it was observed that the level of physical activity decreased with social isolation. Our aim in this study was to examine the effectiveness of calisthenic exercise training on physical activity, quality of life, sleep, anxiety and depression levels in adolescents. **Methods:** Thirty-eight adolescent students who had been studying full-time online education during the pandemic were randomized into two groups; calisthenic exercise group (n=19, mean age= 12,84±0,37, BMI= 21,23± 3,66) and control group (n=19, mean age=13,05±0,84,BMI=21,27±2,27). Calisthenic exercise group received calisthenic exercise training for 8 weeks through the videoconferans and control group didnt receive any exercise treatment. The levels of physical activity were measured by the short form of the International Physical Activity Questionnaire (IPAQ). The Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality. Quality of life was assessed using Pediatric Quality of Life Questionnaire Short Form (PedsQL-SF). The Beck Anxiety Scale (BAS) and Reynolds Adolescent Depression Scale (RADS) were used to determine the level of anxiety. **Results:** There was a statistically significant improvement in physical activity levels (IPAQ p=0.049), anxiety depression (BAS and RADS P=0.007), quality of life (PedsQL-SFp= 0.012) and sleep (PSQI p= 0.045) in the exercise group ($p<0.05$). No significant improvement was observed in any measurement parameters in the control group ($p>0.05$). **Conclusions:** The results of this sudy suggest that calisthenic exercise training at home is effective in physical activity, quality of life, sleep, anxiety and depression levels in adolescents despite social isolation during the Covid-19 pandemic.

Keywords
Online Education, Calisthenic Exercise, Physical Activity, Adolescents

INTRODUCTION

In the current conditions of today's world, sedantary lifestyle has greatly increased bringing along many health problems. In this case, it is essential that individuals adopt an active lifestyle and regularly participate in self-suited exercise programmes. Many studies have shown that regular exercise has positive effects on prevention and treatment of chronic diseases (Orhan and Deniz, 2020).

The fact that individuals adopt an active lifestyle, making it a habit, is particularly relevant to the exercise habits they will have in the adolescent period. In many studies, health benefits of exercise have been investigated and it has been reported that physical activity boosts the immune system, has serious positive effects on overall

Received: 07 March 2022 ; **Accepted:** 16 May 2022 ; **Published:** 20 June 2022
[1]**ORCID**: 0000-0003-2071-904X, [2]**ORCID:** 0000-0003-0603-5688, [3]**ORCID:** 0000-0002-0501-5127, [4]**ORCID:** 0000-0002-4034-580X

physical capacity, stress, depression, anxiety and provides positive social effects (World Health Organization, 2020). Therefore, in order for the healthy development of adolescent individuals, the preparation and implementation of appropriate must be carried out 3 days a week (Gemalmaz and Aksoy, 2020). The growth and development of musculoskeletal system is important for exercise to improve the capacity of adolescent by physiologically developing muscles, nerves and organs (Taskın and Ozdemir, 2018). When adolescence and subsequent inadequate physical activity are not intervened, inactive physical life can have the same negative impact on the quality of life of individuals in the following years (Gemalmaz and Aksoy, 2020). In adolescent who exercise regularly, cardiovascular functions, muscle strength and metabolism have been proven to be better than adolescent who are not active during childhood during the day (Taskın and Ozdemir, 2018; Sardinha et al,2008).

In a study conducted in adolescent between the ages of 13-15, it was determined that 80,3% did not participate in medium-intensity physical activity recommended by the World Health Organization for 60 minutes per day (Aktuğ et al. 2020; Thomas et al. 2017). Despite the benefits of regular physical activity, another study conducted in 15 European countries found that participation in regular physical activities was less than 50% as recommended (Temel et al. 2010). As we can see, there is an inactive population worldwide.

In a study, it was observed that the level of physical activity has decreased with social isolation during Covid-19 pandemic (Ercan et al. 2020). During the Covid-19 restrictions, it is important to remain physically active and have an exercise routine to maintain mental and physical health. The World Health Organization periodically repeats its calls on this issue (Hyunsuk et al.2016). Today, the public health perspective focuses on the protection and development of existing health. The organization of physical activity is primarily important to improve health. Therefore, knowing how inactivity affects life is important for studies to improve physical activity behavior in the future (Ayhan and Pervane Vural, 2020).

In a recent study conducted on 446 university students, it was observed that the rate of physical activity was decreased during the online education due to the Covid -19 pandemic, however exercise programmmes are essential for the individual to continue the habit of exercising later on.

The United States Department of Health and Human Services recommends that physical activity the students who exhibited inactivity during the restrictions had a high desire to develop regular exercise activity behaviour in the future. On the other hand participitants who continued to to do physical activity tended to choose the type of exercises which could be perfomed at home during the pandemic restrictions (Ercan and Keklicek, 2020). In the light of these data, during the ongoing pandemic in our country, it is necessary to gain regular physical activity behaviour in order for children in adolescence to develop physically and mentally. Our aim in this study was to examine the effectiveness of calisthenic exercise training on physical activity, quality of life, sleep, anxiety and depression levels in adolescents.

METHODS

Sample and Study Design

Thirty-eigth adolescent students who had been studying full-time online education during the pandemic were randomized into two groups (Calisthenic exercise group n=19 and Control group n=19). First group received calisthenic exercise training for 8 weeks. Individuals participated in the study through the videoconferans. Healthy adolescent who had no contradiction for regular physical exercise were included in our study (Figure 1). Control group did not receive any exercise training. Both groups were assessed at baseline and at the end of 8 weeks. Participant in this study consisted of volunteered adolescent who were suitable for the age range and met the inclusion criteria for our research between September 2020 and July 2021.This study was approved by the Research Board and Ethics Board of Medicine and Health Sciences at University (Project no: KA20/478) and supported by the Research Fund of University. The Clinical trial number of the study is NCT04942990.

Outcome Measures

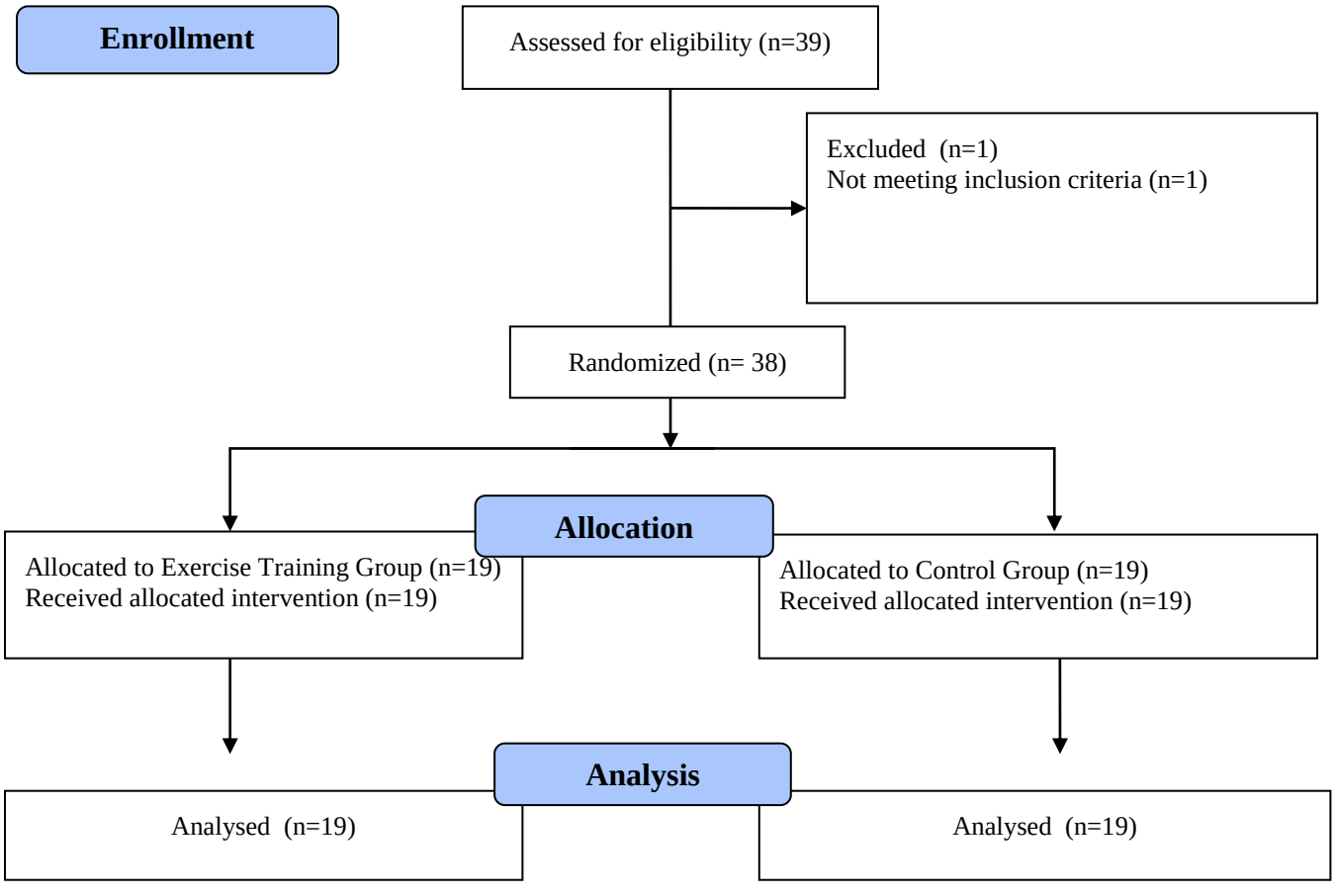
The levels of physical activity were measured by the short form of the International Physical Activity Questionnaire (IPAQ). The validity and reliability of the Turkish version of

IPAQ has been shown previously. This short form consists of 7 questions which provides information about the time spent in severe-moderate walking score indicates better physical activity level. (Sağlam et al. 2010).

The Pittsburgh Sleep Quality Index (PSQI) has been used to assess sleep quality. Sleep measures sleep time, delays in sleep, frequency and severity of sleep-related problems and the impact of poor sleep on the individual's life activity. Total score ranges from 0-21 points and and sitting activities over the past week. The total energy spent is calculated as metabolic equivalent of task (MET) spent per minute. Higher MET

disturbances were assessd initially and at the end of 8 weeks. PSQI consists of 24 questions which >5 points indicates “poor sleep quality” (Ağargün et al. 1996).

Study Flow Diagram



Pediatric Quality of life Questionniare Short Form (PedsQL-SF) has been used to measure the quality of life of the participitants developed by Varni and his friends in 1999, Memik conducted a study of the validity and reliability of the scale in 2008. The scale is scored in three areas. According to this scale, scores and total points are calculated in the areas of emotional functionality, social functionality and school functionality. The scale is scored 0,25,50,75,100 points, equal to 4, 3, 2, 1, 0 respectively. Physical health total score is calculated individually and bullet points are collected assessing emotional, social, school functionality, resulting in psychosocial health total score. Higher points indicate better quality of life (Cakın-Memik et al. 2007). Reynolds Adolescent Depression Scale developed in 1981 and the validity and reliability of the scale in Turkish was

made by Oksay. The scale consists of 6 questions, Higher score indicates higher depressed symptoms (Oskay,1997). The Beck Anxiety Scale was used to determine the level of anxiety. It consists of 21 questions in total. Each item is rated between 0-3. Higer total scores inicate higher anxiety levels. Turkish validity and reliability of the scale was studied by Ulusoy and his friends (Ulusoy et al.1998).

Exercise Training

During the first meeting, individuals were informed about the basic principles of exercise, about the importance of the calisthenic exercises and the physical and mental effects to the body. The exercise program consists of trunk, lower and upper extremity exercises (Figure 1-2). The is rated between 1-4 and total of 30-120 points. duration of the study was targeted as 8 weeks. The trainings consisted of 3 sessions per week, with an average of 45 minutes of calisthenic exercises per session. Exercises initially started with an average of 30 minutes, 10 repetitions, with a difficulty which was gradually increased once every two weeks. The duration of the exercises were gradually increased to 45 minutes. The exercises have been modified for those who have trouble following the training program. The program was completed with 5 minutes of warm-up and 5 minutes of cooling exercises before and after exercise training. All exercises were conducted on a videoconferans supervised by an experienced physiotherapist.

Figure 1

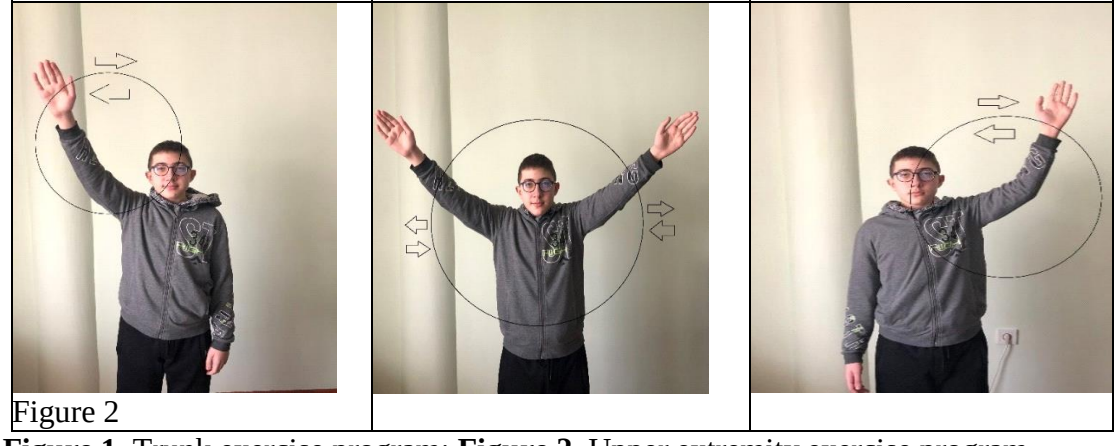


Figure 2

Figure 1. Trunk exercise program; **Figure 2.** Upper extremity exercise program

Statistical Analysis

The sample size of the study to be performed with 85% power has been determined as a total of 38 participants. The data obtained in the study was analyzed using the SPSS version 25 statistical package program. The descriptive statistics gave an average ± standard deviation or median (minimum to maximum), number (n) and percentage (%) for the categorical data, depending on the assumptions for the numeric data. The data was evaluated based on homogeneity and the appropriate parametric analysis were applied. The differences between pre and post-education data were performed by Wilcoxon testing against those that did not meet paired sample t tests for homogeneous distribution, and the comparison between groups were done by independent t test and Mann-Whitney U test.

RESULTS

Our study included a total of 38 people, 19 in the exercise training group and 19 in the control group. Students who were included in the exercise training group participated in all sessions for 8 weeks. The average age of participants was 12.95 ± 0.65 years, the BMI average was 22.25 ± 3 kg/m². The descriptive statistics of the demographic information of the participants are given in Table 1. There was no significant difference between calisthenic exercise group and control group in terms of demographic parameters.

Table 1. Comparison of demographic information by groups

Gender	Study Group n=19	Control Group n=19	p
Female/Male	8(42,1) / 11(57,9)	10(52,6) / 9(47,4)	0,516[b]
Age	12,84 ± 0,37	13.05 ± 0,84	0,329[a]
Height	1,55 ± 4,5	1,57 ± 9,95	0,560[a]
Weight	51,63 ± 9,517	53 ± 9,82	0,665[a]
BMI	21,23 ± 3,662	21,27 ± 2,271	0,968[a]

a: Student t test, mean ± standard deviation, b: Pearson Ki-square test; n(%)

When looking at the differences in IPAQ; there was a significant difference between the total, walking and medium activity sub-dimensions, excluding high level activity, before and after training in the exercise group (p=0.020; p=0.016; p=0.004 respectively), No significant difference was found between the exercise group and the control group in terms of total, walking and high activity sub-size, except for the medium-intensity sub-dimension of the IPAQ (p=0.049) (Table 2).

Table 2. Differences in the International Physical Activity Scale

	Study Group				Control Group			
	Pre-Training	Post-Training	Pα	Effect Size	Pre-Training	Post-Training	Pα	Pβ
IPAQ Walk	396(0-2079)	0(0-1920)	0,016*[b]	0,927	132(0–1400)	0(0 – 1950)	0,157[b]	0,219[d]
IPAQ Medium Activity	0(0 – 725)	396(0– 2772)	0,004*[b]	0,876	0(0 – 650)	0(0 – 1400)	0,480[b]	0,049*[d]
IPAQ High Activity	0(0 – 1920)	0(0 – 1980)	0,248[b]	0,761	0(0 – 2880)	0(0 – 2880)	0,655[b]	0,110[d]
IPAQ Total	543(63 – 3999)	749(84 -4765)	0,020*[b]	0,583	204(0 – 3900)	252(0 – 3276)	0,790[b]	0,057[d]

a: paired sample-t test; mean ± standard deviation, b: Wilcoxon test; median (min-max), d: Mann-Whitney U test; median (min- max), Pα: Comparison of pre-and post-course and control group Pβ: Comparison of two group difference values, *p<0.05

When looking at the differences in quality of life assessment parameters, all parameters in the exercise group were statistically significant (all p<0.05) while no statistically significant difference was found in the parameters in the control group (p>0.05). When looking at the differences in quality of life assessment parameters between groups, there was a significant difference in terms of total scores and physical health scores, but no difference was found in terms of psychosocial health scores (0,012; 0,001; 0,198; respectively) (Table 3).

Table 3. Differences of quality of life assessment parameters

	Study Group				Control Group			
	Pre-Training	Post-Training	Pα	Effect Size	Pre-Training	Post-Training	Pα	Pβ
PedsQL Total	1825 ± 227,3	1930 ± 251,3	0,008*[a]	0,438	1859,2 ± 217,6	1818,4 ± 242,9	0,345[a]	0,012*[c]
PedsQL Physical Health Score	675(400 – 750)	700(525 – 800)	0,003*[b]	0,572	700(225 – 800)	700(225 – 800)	0,590[b]	0,001*[d]
PedsQL Psychosocial Health Score	1196,05 ± 157,9	1251,31 ±196,7	0,080*[a]	0,080[a]	1210,5 ± 123,7	1207,9 ± 119,6	0,937[a]	0,198[c]

a: Paired sample t test; mean ± standard deviation, b: Wilcoxon test; median (min-max), c:Student t test; mean ± standard deviation d: Mann-Whitney U test; median (min-max), Pα: Comparison of pre-and post-course and control group Pβ: Comparison of two group difference values, *p<0.05

When looking at the measurement differences between baseline and 8 weeks in the Reynold Depression scale, there was a statistically significant difference in the exercise group (p=0.003), while there was no statistically significant difference in the control group (p=0.162). Considering the depression assessment, a statistically significant difference was found between the exercise group and the control group in favor of the exercise group (p=0.007). When looking at the measurement differences between baseline and 8 weeks in the Beck anxiety Questionnaire, there was a statistically significant difference in the exercise group (p=0.004), while there was no statistically significant difference in the control group (p=0.705). The anxiety assessment was found statistically significant between exercise group and control group in favor of the exercise group (p=0.007) (Table 4).

Table 4. Differences of anxiety and depression level parameters

	Study Group				Control Group			
	Pre-Training	Post-Training	Pα	Effect Size	Pre-Training	Post-Training	Pα	Pβ
Reynolds Adolescent Depression Scale	53,63 ± 9,32	50,26 ± 9,18	0,003*[a]	0,364	50,79±12,28	53,63 ± 12,29	0,162[a]	0,007*[c]
Beck Anxiety Scale Score	1(0 – 3)	1(1 – 4)	0,004*[b]	0,840	1(0 – 2)	2(1 – 4)	0,705[a]	0,007*[d]

a: Paired sample t test; mean ± standard deviation, b: Wilcoxon test; median (min-max), c: Student t test; mean ± standard deviation d: Mann-Whitney U test; median (min-max), Pα: Comparison of pre-and post-course and control group Pβ: Comparison of two group difference values, *p<0.05

Based on the intra-group differences of the sleep quality levels evaluated by PSQI, the average sleep efficiency (p=0.020), sleep disturbance (p=0.014) and total scores (p=0.002) were found to be significantly different before and after the calisthenic training in the excercise group. Whereas in the control group, no significant difference was found in all sub-parameters (p>0.05). Also there was a significant difference only in the total scores (p=0.045) and sleep times (p=0.048), between the exercise group and the control group (Table 5).

Table 5. Differences of sleep quality level

	Study Group				Control Group			
	Pre-Training	Post-Training	Pα	Effect Size	Pre-Training	Post-Training	Pα	Pβ
PSQI Subjective Sleep Quality	1(0-2)	1(0-1)	0,414[b]	0,074	1(0 – 2)	1(0 – 2)	0,083[b]	0,798[d]
PSQI Sleep Latence	1(0-2)	1(0-2)	1,00[b]	0	1(0 – 2)	1(0 – 2)	0,527[b]	0,611[d]
PSQI Sleep time	0(0-1)	0(0-1)	0,157[b]	0,302	0(0 – 1)	0(0 – 1)	0,157[b]	0,048*[d]
PSQI Typical sleep efficiency	0(0 – 3)	0(0 – 3)	0,020*[b]	0.706	0(0 – 3)	0(0 – 3)	0,746[b]	0,200[d]
PSQI Sleep disorder	1(0 – 2)	1(0 – 1)	0,014*[b]	0.703	1(0 – 2)	1(0 – 2)	1,00[b]	0,086[d]
PSQI Sleeping drug use	0(0 – 2)	0(0 – 0)	0,317[b]	-	0(0 – 0)	0(0 – 0)	1,00[b]	0,317[d]
PSQI Daytime dysfunction	0(0 – 2)	0(0 – 2)	1,00[b]	0	0(0 – 2)	0(0 – 2)	1,00[b]	0,739[d]
PSQI Total	4,31 ± 2,65	2,84± 1,5	0,002*[a]	0.684	4,42±2,32	4,16±2,41	0,543[a]	0,045*[c]

a: Paired sample t test; mean ± standard deviation, b: Wilcoxon test; median (min-max), c: Student t test; mean ± standard deviation
d: Mann-Whitney U test; median (min-max), Pα: Comparison of pre-and post-course and control group Pβ: Comparison of two group difference values, *p<0.05

DISCUSSION

In this study the effects of 8-week online calisthenic exercise training on physical activity, sleep, quality of life, anxiety and depression was assessed during the Covid-19 pandemic. It was observed that calisthenic training had positive effects on sleep quality, quality of life, depression, anxiety, physical activity level and physical activity parameters.

Global spread of the Covid-19 pandemic, strict quarantine measures shut people in their homes, and with this closure, people's physical activity levels decreased significantly. When the physical activity levels and quality of life and depression changes of 168 university students during the pandemic were examined, it was found that this situation affected the quality of life, a sedentary lifestyle was adopted and the susceptibility to depression increased (Cihan and Sahbaz Pirincci, 2020). These negative effects on health, especially the decrease in the levels of physical activity may cause serious concerns (Kartal et al. 2020). However, due to the developed immune system in those who do regular physical activity, it both prevents the disease and makes it easier to overcome the disease after being caught (Korkmaz et al. 2020). Therefore it is necessary to determine the physical activity status of individuals in the risk group and to give an appropriate physical activity program (Cihan and Sahbaz Pirincci, 2020; Bulguroglu et al.2021). In the study conducted on 269 students, it was determined that 61.3% of the students did not follow the physical education lessons during the online education, and 65.8% of the students were found to move less during the Covid-19 pandemic. It is recommended to do aerobic and strength exercises at least 4-5 days a week in order to increase sedentary life, reduce psychological distress and maintain physical fitness in the pandemic (Korkmaz et al. 2020, Celik and Yenal, 2020). Also it is emphasized that severe physical activities should be avoided in terms of the immune system, and that moderate physical activities should be increased to support immunity (Aktuğ et al. 2020). The online calisthenic exercise program that we gave to adolescents during online education process in this study concluded in an increased level of physical activity in the exercise group. This increase seems to be an increase in moderate physical activity and walking. Calisthenic exercise training is a moderate level exercise training, in terms of cardiopulmonary systems parameters. Higher intensity training programmes other than calisthenic exercise training may have positive effects on higher physical activity levels but these exercise programmes should be given after a comprehensive cardiopulmonary evaluation.

Similar to our study; in a study which examined the effect of exercise training applied to university students during the pandemic, no significant change was found in the vigorous physical activity scores, but there was a significant change in the walking scores. Similar to our study,

it was observed that the change in moderate physical activity scores was positively affected (Küçük, 2021). In our current situation, we think that health services and the government should carry out studies that will encourage physical activity for students, exercise programs that can be applied at home should be given and encouraged for all individuals, and studies should be carried out to improve their physical activity levels after the pandemic (Aktuğ et al. 2020; Celik and Yenal, 2020). Changes in the physical activity levels affect quality of life. In a study conducted during the social isolation of the Covid-19 pandemic, it was found that decrease in physical activity negatively affected the psychological state due to its negative impact on the quality of life (Kaya Ciddi and Yazgan, 2020). In another study conducted on 4805 female adolescents aged 11-18 years, it was reported that 39.5% of the participants got high scores on the depression scale. It has been reported that the increase in depression, especially distance education, illness-related anxieties, daily sleep duration less than 6 hours, and daily physical activity less than 30 minutes are closely related to depression symptoms (Zhou et al. 2020). Studies in the literature prove that physical activity affects quality of life. In a study conducted with university students, it was stated that the level of physical activity positively affects the quality of life (Cihan and Sahbaz Pirincci, 2020). In another study conducted in 567 people during the pandemic, it was found that individuals who exercised had a higher quality of life than those who did not. It has been found that increased physical activity has a positive effect on general health (Boutelle et al. 2000). Strine et al. reported that as the severity of depression increases, the quality of life decreases (Cihan and Sahbaz Pirincci, 2020; Strine et al. 2009). In this process, many studies suggest that young people should be informed about exercises they can do at home (Bulguroğlu et al. 2021). In our study the training group showed significant positive change in the physical health. scores and the total scores psychosocial health Psychosocial health score showed a significant change, but when we applied the Beck Anxiety and Reynold Adolescent Depression Scales, psychosocial status was affecte positively. Similar to the literature we found that exercise training increased quality of life. Increasing the quality of life at a later age have a positive impact on the general health status and prevents from life-threatening diseases (Kartal et al. 2020; Isıklar, 2021).

Another factor affecting quality of life is reducing psychological stress. In the conditions we live in, our quality of life is affected by catching diseases, deaths, and changes in our lives, and this situation has a negative impact on our health (Kaya Ciddi and Yazgan, 2020). Many factors such as continuing education remotely during the pandemic process and not knowing when the process will end, increasing quarantine rules, feeling of loneliness, increasing time spent at home, eating disorders, increasing economic difficulties, deteriorating sleep habits, especially depression and anxiety disorders in the adolescent age group, including mental problems. In a survey conducted on 2530 university students to examine the psychological effects of Covid-19 in Spain, it was determined that individuals' anxiety, depression and stress levels increased (Odriozola-Gonzalez et al. 2020). Also in a questionnaire study, in which 1210 individuals participated in order to measure the psychological state in the pandemic, it was determined that 16.5% had moderate depression, 28.8% had moderate anxiety symptoms and 8.1% had moderate-severe stress symptoms. It was concluded that 84.7% of the participants spent 20-24 hours at home at home (75.2%) and were worried about their family members catching the disease (Wang et al. 2020). The stress, anxiety in 20.8%, depression symptoms in 17.3% and sleep problems in 7.3% 33. In order to see the psychological effects of physical activity, individuals who did not exercise during the pandemic period were compared with those who did regular exercise. The anger, tension and sadness levels of the individuals who did not exercise were found to be significantly higher than those who did. It has been determined that the quality of life and mood are positively affected by physical activity, the quality of life will increase with exercise, and the mood is positively affected by exercise (Berk, 2021).

As a result of exercise training in our study we found that the Reynolds Adolescent Depression Scale and Beck Anxiety Scale scores in the training group showed a significant improvement.

Sleep is the body's physical and mental rest that provides time for renewal as a biological process. Sleep quality and sleep division are important factors for waking up refreshed in the morning and being refreshed during the day. The

deterioration of sleep quality, decrease in tquality of life may negatively affect physical and mental health and may lead to serious health problems. Being in the house as a result of quarantine measures in the remaining subjects, sleep efficiency, sleep duration and sleep duration are known to be negatively affected. In a study conducted among university students it was reported that the quality of sleep reduced due to disturbed sleep patterns and waking up early in the morningand waking up tired were the most important indicators (Ilhan et al. 2020).

In accordance with the literature our findigs support that 8 week exercise have resulted in a decrease in total PSQI scores which represents an increase in the quality of sleep. The sleep duration was increased and sleep efficiency was reduced by the time spend in bed sleeping. This situtaion impacted from process of waking up in the middle of the night such as going to the bathroom, getting up, snoring, difficulty in breathing, pain problems. It has been found that there could be significant differences in sleep latency, subjective sleep quality, and daytime dysfunction, during medication for sleep disturbances. In our study there was only one participant who was using sleeping pills, therefore no significant difference has been found. The physiotherapy and rehabilitation services and health workers are working in many fields in order to overcome the pandemic with minimum damage in our country just like the whole world. It is important to evaluate physical activity levels, sleep quality, quality of life, psychosocial status, and physical activity levels of adolescents for their healthy development. We think that as a result of these studies the negative effects of the pandemic will reduce to a minimum by supporting adolescent and adolescents physically and mentally.

Conclusions

As a result, it was observed that calisthenic training applied in healthy adolescents increased sleep quality, quality of life, depression, anxiety, physical activity levels and physical activity parameters. We suggest that online calisthenic exercise training is useful and that it may be given to adolescents during and after the pandemic.

Funding Source/Trial Registration

Funding Source/Trial Registration

Funding: None This study is registered at www.clinicaltrials.gov (NCT04942990).

Conflict of interests

The authors have no conflict of interests to declare. No financial support was received for this study.

Ethics Statement

Ethical approval was obtained from the ethics committee of Başkent University, Medicine and Health Sciences Research Boardfor the study to be performed (Number: 07.04.2021/21-59).

Author Contributions

Study design; KA (%30), NÖP (%70). Data collection; KA(%40), NÖP(20), OÜY(%20), HCT (%20). Statistical analysis; KA(%10), NÖP(%40), OÜY(%50). Data interpretation; KA(%30), NÖP(%40), OÜY(%30). Manuscript preparation; KA (%10), NÖP(%30, OÜY(%30), HCT (%30). Literature search; KA (%10), NÖP(%30), OÜY(%30), HCT(%30). All authors have read and agreed to the published version of the manuscript.

REFERENCES

Ağargün, M.Y., Kara, H., Anlar, O. (1996). The Validity and Reliability of the Pittsburgh Sleep Quality Index. *Turkish Journal of Psychiatry*;7(2):107-115.

Aktuğ, Z.B., İri, R., Aktuğ Demi, N. (2020). COVID-19 immune system and exercise. *J Hum Sci*;17(2):513-520.

Ayhan, F.F., Pervane Vural, S. (2020). Physical activity, obesity and COVID-19. Ayhan FF, Demirbağ Kabayel D, eds. *Turkey Clinics COVID-19*;75-82.

Berk, Y. (2021). Investıgatıon Of The Effect Of Physıcal Actıvıty On The Qualıty Of Lıfe And Emotıon Durıng Covıd-19 Pandemıa Process. *Hacettepe Journal of Sport Sciences*;(2):57-70.

Boutelle, K.N., Murray, D.M., Jeffery, R.W., Hennrikus, D.J., Lando, HA. (2000). Associations between exercise and health behaviors in a community sample of working adults. *Prev Med*;30(3):217-224.

Bulguroğlu, H., Bulguroğlu, M., Özaslan, A. (2021). Investigation of Physical Activity, Quality of Life and Depression Levels of University Students During the Covid-19 Pandemic Process. *Acıbadem University Journal of Health Science*;12(2):306-311.

Cağlayan Tunç. A., Zorba, E., Çingöz, Y. (2020). The Effect of Exercise on Quality of Life in

the Period of Pandemic (Covid 19). *UGEAD - IntJCES*; 6(1): 127-135.

Cakın-Memik, N., Ağaoğlu, B., Coşkun, A., Üneri, Ö.Ş., (2007). Karakaya I. The validity and reliability of the Turkish Pediatric Quality of Life Inventory for children 13-18 years old. *Turkish Journal of Psychiatry*;18(4):353-363.

Celik, F., Yenal, T. (2020). Covid-19 and Physical Inactivity. *Mediterranean Journal of Sport Science*;3(2): 249-259.

Cihan, E., Sahbaz Pirincci, C. (2020). Life quality relationship of young population with physical activity level and depression level in Covid-19 pandemıc period. *Journal of Selçuk Health, Covid-19 Special*; 41-53.

Ercan, E.S., Arman, A.R., Emiroğlu, N.I. Öztop, D.B., Yalçın, Ö. (2020). Turkey association of child and adolescent psychiatry the family, children and psychosocial support, and spiritual guide for adolescentsduring Covid-19 (corona) virus epidemic. *Turkish Child and Adolescent Psychiatry Association*.

Ercan, Ş., Keklicek, H. (2020). Investigation of the change in physical activity levels of university students due to COVID-19 Pandemic. *Izmir Katip Celebi University Faculty of Health Sciences Journal;* 5(2): 69-74.

Gemalmaz, A., Aksoy, U. (2020). Obesity and exercise in adolescent period. Kurdak H, ed. Aile Hekimliğinde Egzersiz. 1. Baskı. Ankara: *Turkey Clinics*; 47-50.

Hyunsuk, J., Hyeon, W.Y., Yeong-Jun, S., Moran, K., Jung-Ah, M., Juhee, C., Jeong-Ho, C. (2016). Mental health status of people isolated due to Middle East Respiratory Syndrome. *Epidemiol Health*; 38: e2016048

Ilhan Alp, S., Deveci, M., Erdal, B., Akalın, R., Terzi, D. (2020). Quality of Sleep and insomny violence in university students in the period of COVID-19. *NKMJ*; 8(3): 295-302.

Isıklar, Ç. (2021). The importance of sports and exercises in childhood, *Fenerbahçe University Journal of Health Science*; 1(1):36-44.

Kartal, A., Ergin, E., Kanmış, H. (2020). COVID-19 Suggestions about healthy nutrition and physical fitness exercise during Covid-19 pandemic. *Avrasya Journal of Health Science;* 3:149-155.

Kaya Ciddi, P., Yazgan, E. (2020). The effect of physical activity status on quality of life during social isolation in Covıd-19 epidemic. *İstanbul Ticaret University Journal of Social Sciences, Spring (Covid19-Special*); 262-279.

Korkmaz, N., Öztürk, İ., Rodoplu, C., Uğur, S. (2020). Investigation of changes in physical activity levels of secondary school students during the covid-19 outbreak process (Bursa case example)). *Journal of Physical Education and Sport Sciences*; 22(4):101-115.

Kücük, G., Durutürk, N. (2022). The Effects of Exercise Training in Distance Education University Students on Physical Activity, Quality of Life and Sleep, and Levels of Anxiety, Depression: Randomized Clinical Study. Turkiye Klinikleri J Health Sci; 7(1):138-47

Odriozola-González, P., Planchuelo-Gómez, A., Jesús Irurtia, M., Luis-García, R. (2020). Psychological effects of the COVID-19 outbreak and lockdown among students and workers of a Spanish university. *Psychiatry research*; 290: 113108.

Orhan, O., Deniz, B. (2020). In the Dawn of the Pandemics: COVID-19 and physical inactivity. *Izmir Kâtip Çelebi University Faculty of Health Science Journal*; 5(2):143-146.

Oskay, G. (1997). Reynolds Ergen Depresyon Ölçeğinin (Reynolds Adolescent Depression Scale-Rads) Adaptation to Turkish, validity and reliability study. *Turkish Psychological Counseling and Guidance Journal;* 2: 17-26.

Rossi, R., Socci,V., Talevi, D., Mensi, S. Niolu, C., Pacitti, F., Di Marco, A., Rossi, A., Siracusano, A., Di Lorenzo, G. (2020). COVID-19 pandemic and lockdown measures impact on mental health among the general population in Italy: An N= 18147 web-based survey. *medRxiv*; 18(2):321-31.

Sağlam, M. Arıkan, H., Savcı, S. (2010). International physical activity questionnare reliability and validity of turkish version. *Percept Mot Ski*; 11:278-284.

Sardinha, B., Baptista, F., Ekelund, U. (2008). Objectively measured physical activity and

bone strength in 9-year-old boys and girls. *Pediatrics*;122:728-736.

Strine, T.W., Kroenke, K., Dhingra, S., Balluz, L.S., Gonzalez, O., Berry, J.T., Mokdad, A.H. (2009). The associations between depression, health-related quality of life, social support, life satisfaction, and disability in community-dwelling US adults. *J Nerv Ment Dis*; 197(1):61-64.

Taskın, G., Ozdemir, S.F. (2018). The importance of exercise on children. *Gazi Journal of Physical Education and Sport Sciences*; 23(2): 131-141.

Temel, F., Hancı, P., Kasapoğlu, T., Kışla, R.M., Sarıkaya, M.S., Yılmaz, M.A., et al. (2010). The sleep quality of students in vocational high school in Ankara and influencing factors. *Journal of Child Health and Diseases*;53:122-131.

Thomas, E., Bianco, A., Mancuso, E.P., Patti, A., Tabacchi, G., Paoli, A., Messina, G., Palma, A. (2017). The effects of a calisthenics training intervention on posture, strength and body composition Isokinet Exerc Sci; 25(3):215-222.

Ulusoy, M., Şahin, N., Erkmen, H. (1998). Turkish version of the Beck Anxiety Inventory: Psychometric Properties. *J Cogn Psychother;* 12:163-172.

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C.S., Ho, R.C. (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *Int J Environ Res Public Health*; 17(5):1729.

World Health Organization. Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected: Interim guidance. Retrieved March 13, 2020 from https://www.who.int/publications-detail/clinical-management-of-severe-acuterespiratory-infection-when-novel-coronavirus-(ncov)-infection-issuspected

Zhou, J., Yuan, X., Qi, H., liu, R., li, Y., Huang, H., et al. (2020). Prevalence of depression and its correla-tive factors among female adolescents in China during the coronavirus disease 2019 outbreak. *Global Health;* 16-69.

How to cite this article:
Altuntaş, K., Özünlü Pekyavaş, N., Ümit Yemişçi, O. and Tezeren, H.C. (2022). The Effectiveness of Calistenic Exercise Training in Adolescents Receiving Online Education During COVID-19 Pandemic. *Int J Disabil Sports Health Sci*;5(1):38-48.https://doi.org/10.33438 /ijdshs.1082757

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

RESEARCH ARTICLE

Bibliometric Analysis of The Olympic Games and Doping Research

Mustafa Ertan TABUK [*1]

[1] *Hitit University, Sport Science Faculty, Sport Management Department, Çorum, Türkiye*
*Corresponding author: ertantabuk@gmail.com

Abstract

Doping controls are carried out in all international mega sports organizations such as the Olympic Games to determine the use of doping. Prevention of doping use is carried out by the "Anti-doping Organization", WADA, which has an international participation structure. However, issues such as use of doping, doping agents, and using methods attract the attention of researchers. The research aims to analyze all scientific publications between 1980 and 2021 and to make a holistic analysis on doping using data obtained within the scope of the study, information graphics and explanatory bibliometric networks were created. This research is a kind of qualitative research method conducted to determine the researches between the Olympics and doping studies. According to the results, most used keywords were found to be "doping", "Olympic Games" and "doping control". There are a total of 96 journals evaluated within the scope of our study. "*British Journal of Sports Medicine*", "*Deutsche Zeitschrift Für Sportmedizin*" and "International Journal of The History of Sport" are most cited journals. Top publishing institutes are "University of Western Australia", "German Sport University Cologne" and "National and Kapodistrian University of Athens". Finally, and in turn, top broadcasting countries are USA, United Kingdom, Germany, Australia, and Switzerland. According to the results of the research, most of the research on doping focuses on chemical analysis of substances used as doping. It may be useful to conduct research on the physical, social and moral reasons and possible legal consequences of doping use and its effect on sports.

Keywords
Doping, Olympic Games, Bibliometry, Scientometric

INTRODUCTION

The use of doping, which is a way that athletes have used to win games since ancient Olympics to present time, is an understanding against the Olympic philosophy. Various methods have been used to increase performance even in ancient times. Gladiators (athletes) used stimulants extracted from various plants in the Greek, Egyptian and Roman periods (Verroken, 2005). Use of vitamins and minerals are widely seen today as a situation that normalizes the supplement consumption of athletes (Millman, 2003) for reasons such as the substitution of energy loss due to high performance, compensation for malnutrition, preservation of health, providing extra energy and increasing performance (Burke, 1993).

With the establishment of the IOC in Paris in 1894, the modern Olympics have started in 1896. Composed of a body of equal representatives from the Olympic Movement and public authorities, *The World Anti-Doping Agency* is established in 1999 on the initiative of International Olympic Committee as a foundation with the Lausanne Declaration published at the Doping Conference in Sport – which was organized for the first time by the International Olympic Committee in Lausanne, Switzerland between 2-4 Feb 1999 – to encourage and coordinate the fight against doping in sports at the international level with the support and participation of governments, public authorities

Received: 25 March 2022 ; **Accepted:** 28 May 2022 ; **Published:** 20 June 2022
[1]**ORCID**: 0000-0002-6192-5731

and other public/private organizations fighting doping in sports. Its core activities include education, building anti-doping capacities, scientific research and monitoring the World Anti-Doping Code, which harmonizes anti-doping policies in all sports and all countries. With the WADA-Code, published by WADA in 2004, it has ensured that standard applications are made worldwide (Houlihan, 2014).

In addition, the World Anti-Doping Program has been established within the scope of fighting doping in the world. First stage of the program is Anti-Doping Code. It is a basic and universal document created to advance the struggle against doping, trying to achieve universal harmony on which anti-doping elements are based on World Anti-Doping Program in Sports (WADA, 2015). According to WADA records, number of samples analyzed in all sports branches in 2019 is 278,047 (Olympic Sports n = 228,560, Non-Olympic Sports, n = 49,487). 310,543 (urine sample n = 252,708, blood sample n = 25,339) samples were analyzed in 31 WADA Laboratories around the world (WADA, 2019). Fight against doping continues to expand with the studies within the scope of WADA.

The term of bibliometrics was first coined by Pritchard to replace the ambiguous term of ‘‘*statistical bibliography’’* (Pritchard, 1969). Bibliometrics is widely used in the social sciences and it is a developing scientific branch providing analyses of academic literature in a certain field (Diem and Wolter, 2013; Dominko and Verbič, 2019; Ellegaard and Wallin, 2015; Flores Kanter, 2017; Ivanović and Ho, 2019; McMillan and Hamilton, 2000; Mamdapur and Şenel, 2020). In miscellaneous settings, the best available information can be searched through bibliometric analysis of schools or scholars (Klein and Bloom, 2005). It is also used to analyze many data such as the features of the articles, citations, number of authors, productivity of the literature. Although there are many studies in different fields, literature lacks a scientometric review of doping. In this study, it is aimed to perform a bibliometric analysis of doping research associated with Olympic Games. This study aims to provide a systematic analysis of the researches on doping in the light of obtained data. Through analysis made, this search tries to provide systematic and specific information on the country, institute, journal information, authors and keywords etc. for new researches.

MATERIALS AND METHODS

Data collection procedure

In this study, academic studies on the Olympic games and doping in the "Web of Science Core Collection" (n=262) database were searched and indexed. “Doping” and “Olympic Games” keywords is used for our search including all publications between 1980 and 2021. According to the United Nations classification, studies published in Ireland, England, and Scotland are classified under the title of United Kingdom. (United Nations, 2019). An Infographic of bibliometric networks was created using descriptive bibliometric networks (Vosviewer n.d.).

RESULTS

Data analysis

A total of 262 articles - published between 1980 and 2021 - are found in our search. Most researched areas of doping literature related to Olympic Games are found to be Science Technology, Life Sciences Biomedicine, and Social Sciences. There is an increase in the number of publications as of 2007, with the highest number of publications in 2017 (n=23, Figure 1). Web of Science database is leading of the literatüre. The types of documents on this subject are original articles, reviews, others, editorials, and meeting reports (87.40, 19.84, 14.12, 7.63 and 7.63 respectively; Table 1) mostly.

Table 1. Top ten authors, countries, institutions and journals indexed in Web of Science database between 1980 and 2021.

Document Types	Records count	Percentages
Article	229	87.40
Review	52	19.84
Other	37	14.12
Editorial	20	7.63
Meeting Reports	20	7.63
Abstract	7	2.67
Book	5	1.90
Letter	5	1.90
Case Report	3	1.14
Top Authors		
Fitch, Kenneth Duncan	30	11.45
Georgakopoulos, Costas	16	6.10
Kazlauskas, Rymantas	9	1.90
Catlin, Don H.	8	3.05
Budgett, Richard	7	1.52
Schanzer, Wilhelm	5	1.90
Ljungqvist, Arne	4	1.52
Lyris, Emmanouil	4	1.52
Pereira, Henrique M. G.	4	1.52
Segura, Jordi	4	1.52
Most Productive Countries		
United States of America	40	15,26
United Kingdom	38	14,5
Germany	27	10,3
Australia	26	9,92
Switzerland	23	8,77
Canada	19	7,25
Greece	16	6,1
Brazil	13	4,96
Italy	12	4,58
People Republiz of China	11	4,19
Most Productive Institutions		
University of Western Australia	25	9.54
German Sport University Cologne	14	5.34
National and Kapodistrian	6	2.29
University of Athens	6	2.29
University of London (UK)	6	2.29
Universidade Federal Do Rio De	5	1.90
University of California System	5	1.90
Antidoping Lab Qatar	4	1.52
Freie University Of Berlin	4	1.52
International Olympic Committee	4	1.52
Most Productive Journals		
British Journal of Sports Medicine	13	4.96
Deutsche Zeitschrift Für	13	4.96
International Journal of The	12	4.58
Clinical Journal of Sport Medicine	12	4.58
Drug Testing and Analysis	11	4.19
Sports Medicine	10	3.81
Bioanalysis	8	3.05
The Journal of Sports and	7	2.67
Clinical Chemistry	6	2.29
Sport in Society	6	2.29

Authors' Productivity, Countries, Institutes and Journals

A total of 262 researches in doping studies related to Olympic Games are determined. As seen in Table 1, it is observed that authors named Fıtch KD. (n=30) and Georgakopoulos C. (n=16) lead the researches. The United States (USA) took part in the first conversation with 40 articles followed by United Kingdom, Germany, Australia and Switzerland (40, 38, 27, 26 and 23; Table 1). In terms of institutes contributing to the doping literature, Australia leads with the highest number (n=25) of publications. Greece contributed to literature by researches of two institutes (n=12). Most contributing journals to doping studies related to Olympic Games are "British Journal of Sports Medicine", "International Journal of The History of Sport and Drug Testing and Analysis" (n = 13, 12 and 11 respectively; Table 1).

Citation analyses

The h-index of Doping literature is calculated as 31 and an average citation per item is measured to be 14.53 times (Table 2). The most cited document "*Hormonal Doping and Androgenization of Athletes: A Secret Program of the German Democratic Republic Governmen*t" written by Franke and Berendonk was an original article (Franke & Berendonk 1997). This article is published in 1997 and received citations 258 times (10.32 times per year; Table 2).

Keyword and bibliometric network analyses

Keyword analysis (Table 2) reveals that "Doping", "Olympic Games", "Doping Control", "World Anti-Doping Agency" and "Asthma" (s=54, 44, 20, 17 and 16, respectively) are most commonly used words. Vosviever application was used to create bibliometric network analysis and info graphics. Results show us three keyword centers are seen in the literature. These are "Doping", "Olympic Games" and "Doping Control". The word doping is one of the central keywords linked to "Olympic Games", "Banned Substances" and "Doping Control" whereas "Olympic Games" keyword seems to be more related to "Doping Control", "Athletes" and "Test Methods".

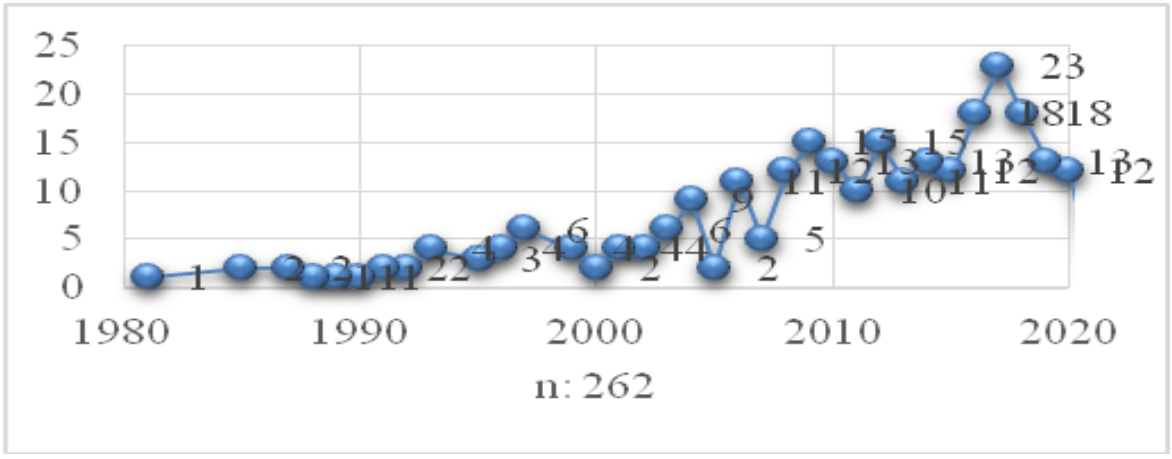


Figure 1. Total number of publications of Doping and Olympic Games literature by year.

Table 2. Citation changes, h-index, most cited articles and keywords of Doping and Olympic Games literature between 1980 and 2021.

h-index and citation changes					
WoS Database Publication Period	**n**	**h-index**	**Average citation per item**	**Sum of citation without self-citations**	**Sum of citing articles without self-citations**
1980-1989	7	4	24.43	171	166
1990-1999	26	14	32.12	824	710
2000-2009	70	22	25.56	1743	1430
2010-2020	156	18	6.47	976	847
1980-2021	262	31	14.57	3584	2815

Ten most cited articles				
Title	**Authors**	**Year**	**TC**	**ACPY**
Hormonal Doping and Androgenization of Athletes: A Secret Program of the German Democratic Republic Government	Franke, WW; Berendonk, B.	1997	258	10.32
Second-generation Blood Tests to Detect Erythropoietin Abuse by Athletes	Gore, CJ; et al.	2003	168	8.84
Asthma and the Elite Athlete: Summary of the International Olympic Committee's Consensus Conference, Lausanne, Switzerland, January 22-24, 2008	Fitch, KD; Sue-Chu, M; et al.	2008	143	10.21
The Use of Dietary Supplements and Medications by Canadian Athletes at the Atlanta and Sydney Olympic Games	Huang, SH; Johnson, K; Pipe, AL	2006	135	8.44
Medication Use in Athletes Selected for Doping Control at the Sydney Olympics (2000)	Corrigan, B; Kazlauskas, F	2003	114	6
Analytical-Chemistry At The Games Of The Xxiiird Olympiad in Los-Angeles, 1984	Catlin, DH; et al.	1987	109	3.11
The Use of Drugs and Nutritional Supplements in Top-Level Track and Field Athletes	Tscholl, P; et al.	2010	94	7.83
Ultra High Performance Liquid Chromatography Tandem Mass Spectrometry Determination and Profiling of Prohibited Steroids in Human Biological Matrices. A review	Gosetti, F; et al.	2013	82	9.11
Preventive Doping Control Analysis: Liquid and Gas Chromatography Time-of-Flight Mass Spectrometry for Detection of Designer Steroids	Georgakopoulos, C; et al.	2007	79	5.27

Table 2. Continue

TC (total citations), ACPY(average citation per year)			
Most used 20 keywords			
1	Doping (54)	11	Designer Steroids (10)
2	Olympic Games (44)	12	Lc-Ms (10)
3	Doping Control(20)	13	Nutritional Supplements (10)
4	World Anti-Doping Agency - WADA (17)	14	Sports (10)
5	Asthma (16)	15	Mass Spectrometry (9)
6	Beta(2)-Agonists (16)	16	Ioc (9)
7	Athletes (13)	17	Anabolic Steroids (8)
8	Airway Hyper responsiveness (12)	18	Anti-Doping (8)
9	Olympics (12)	19	Bronchial Provocation (8)
10	Olympic Games Sydney 2000 (11)	20	Endurance Training (8)

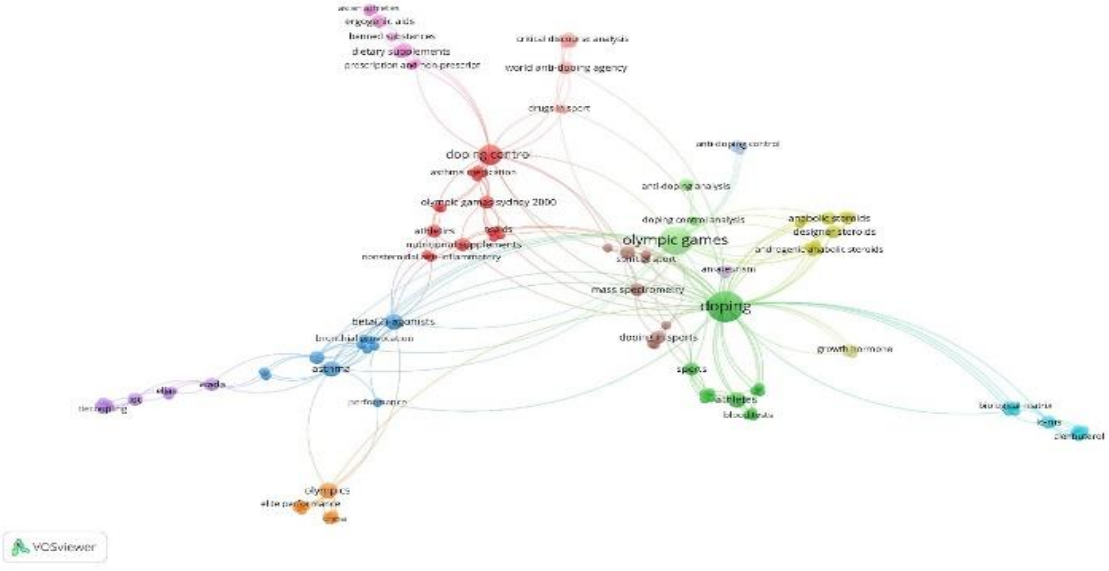


Figure 2. Keyword network of Doping literature related to Olympic Games.

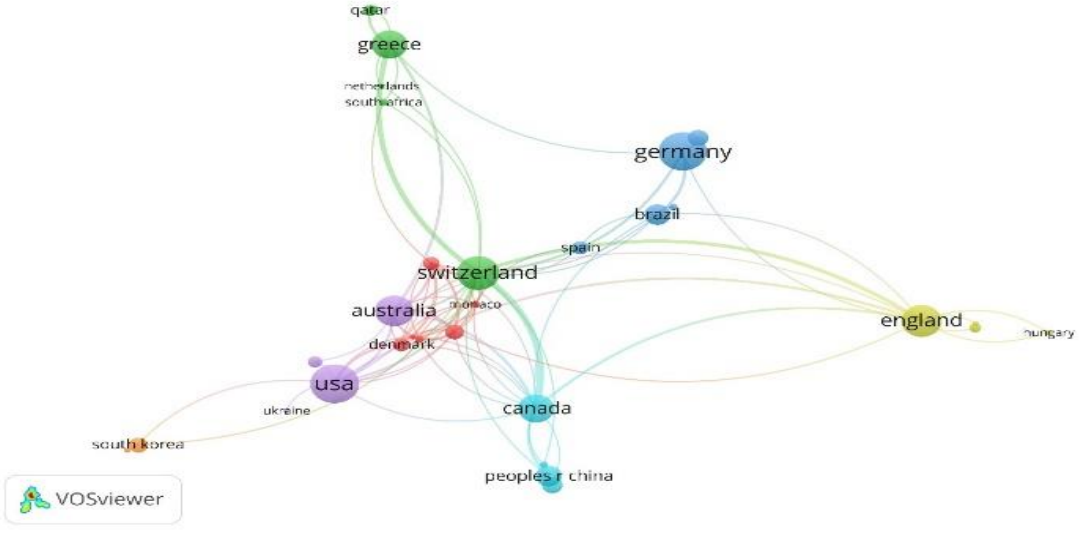


Figure 3. Bibliometric network of the countries publishing doping literature related to Olympic Games.

DISCUSSION

In this study, a bibliometric analysis is conducted in order to reveal relationships between concepts in keywords and abstracts, the most cited authors, the most cited journals and countries with highest number of academic studies in doping studies. H-Index of doping and Olympic Games are measured as 31 with a total number of 3,804 citations. A great connection between "Doping" and "Olympic Games" keywords is identified.

Results show that most used keywords are "doping", "doping control", "Olympic Games" and "nutritional supplements". Citation analysis reveals that Fitch and Georgakopoulos are most cited authors. There are a total of 100 journals in the data. "*British Journal of Sports Medicine", "International Journal of The History of Sport, Drug Testing and Analysis"* are most cited journals. Top publishing institutes are "*The University of Western Australia*" and "*German Sport University Cologne*".

Finally and respectively, top publishing countries are USA, UK, Germany, Australia and Switzerland. Based on all of our results and literature discussion, suggestions for authors are presented below:

The limitations of the study; firstly, we preferred only WoS database. The other databases "*KCI-Korean Journal Database, SciELO Citation Index and Russian Science Citation Index, PubMed, Scopus, Index Copernicus or DOAJ*" was not used in this article. Secondly, we are only able to reach documents published back in 1980 since WoS could not provide items before this. Thirdly, Since the keywords used in bibliometric research are mostly focused on researcher preferences and a similar study has not been found, a comparison of the research findings could not be made. This research is the first bibliometric research to include doping and the Olympic games. Researchers should be encouraged and supported to carry out for more articles in the subject of doping.

The studies mostly focus on elite athletes' treatment of respiratory diseases (Fitch. et al., 2008), methods of doping control (Trout, & Kazlauskas, 2004; Georgakopoulos, et al. 2007) athletes' use of supplementation and athlete habits (Huang, Johnson, & Pipe, AL 2006; Tsitsimpikou, et al, 2009).

Researchers are recommended to conduct studies involving mega events such as world cups in other sports. Furthermore, researchers can also focus on the design of training programs on issues such as banned substance use that may potentially occur during use of dietary supplements in elite athletes.

Conflict of interest

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

Ethics Statement

Ethical approval is not required due to the use of open source databases in the research. All stages of the study were carried out in accordance with the Principles of the Declaration of Helsinki.

REFERENCES

Burke, L.M. & Read, R.S. (1993). Dietary supplements in sport. *Sports Medicine, 15*(1), 43-46.

Diem, A. & Wolter, S.C. (2013). The use of bibliometrics to measure research performance in education sciences. *Research in higher education, 54*(1), 86-114.

Dominko, M. & Verbič, M. (2019). The economics of subjective well-being: A bibliometric analysis. *Journal of Happiness Studies*, *20*(6), 1973-1994.

Fitch, K.D., Sue-Chu, M., Anderson, S.D., Boulet, L.P., Hancox, R.J., McKenzie, D.C. & Ljungqvist, A. (2008). Asthma and the elite athlete: summary of the International Olympic Committee's consensus conference, Lausanne, Switzerland, January 22-24, 2008. *Journal of Allergy and Clinical Immunology*, *122*(2), 254-260.

Georgakopoulos, C.G., Vonaparti, A., Stamou, M., Kiousi, P., Lyris, E., Angelis, Y.S., ... & Koupparis, M. (2007). Preventive doping control analysis: liquid and gas chromatography time of flight mass spectrometry for detection of designer steroids. *Rapid Communications in Mass Spectrometry: An International Journal Devoted to the Rapid Dissemination of Up to the Minute Research in Mass Spectrometry*, *21*(15), 2439-2446.

Houlihan, B. (2014). Achieving compliance in international anti-doping policy: An analysis of the 2009 World Anti-Doping

Code. *Sport Management Review*, *17*(3), 265-276.

Huang, S.H.S., Johnson, K. & Pipe, A. L. (2006). The use of dietary supplements and medications by Canadian athletes at the Atlanta and Sydney Olympic Games. *Clinical Journal of Sport Medicine*, *16*(1), 27-33.

Ivanović, L. & Ho, Y.S. (2019). Highly cited articles in the education and educational research category in the social science citation Index: A bibliometric analysis. *Educational Review*, *71*(3), 277-286.

Klein, W.C. & Bloom, M. (2005). Bibliometrics: The best available information?. *Social Work in Health Care*, *41*(3-4), 117-121.

McMillan, G.S. & Hamilton Iii, R.D. (2000). Using bibliometrics to measure firm knowledge: an analysis of the US pharmaceutical industry. *Technology Analysis & Strategic Management*, *12*(4), 465-475.

Millman, R.B., & Ross, E.J. (2003). Steroid and nutritional supplement use in professional athletes. *The American Journal on Addictions*, *12*, S48-S54.

Pritchard, A. (1969). Statistical bibliography or bibliometrics. *Journal of Documentation*, *25*(4), 348-349.

Senel, E. & Mamdapur, G.M.N. (2020). A Holistic Evaluation of Buddhism Literature: A Bibliometric Analysis of Global Publications Related to Buddhism Between 1975 and 2017. *Library Philosophy and Practice*, 1-14.

Trout, G.J. & Kazlauskas, R. (2004). Sports drug testing–an analyst's perspective. *Chemical Society Reviews*, *33*(1), 1-13.

Tsitsimpikou, C., Tsiokanos, A., Tsarouhas, K., Schamasch, P., Fitch, K.D., Valasiadis, D., & Jamurtas, A. (2009). Medication use by athletes at the Athens 2004 Summer Olympic Games. *Clinical Journal of Sport Medicine*, *19*(1), 33-38.

Verroken, M. (2000). Drug use and abuse in sport. *Best Practice & Research Clinical Endocrinology & Metabolism*, *14*(1), 1-23.

Vosviewer. (n.d.). VOSviewer - Visualizing Scientific Landscapes. https://www.vosviewer.com/. Accessed 10 January 2021.

WADA. (2015). World Anti-Doping Code, World Anti-Doping Agency, p. 14, Canada. Montreal.

How to cite this article: Tabuk M.E. (2022). Bibliometric Analysis of The Olympic Games and Doping Research. *Int J Disabil Sports Health Sci*; 5(1):49-55.https://doi.org/10.33438/ijdshs.1093414

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

CASE REPORT

Effects of A Progressive Rehabilitation Program on Shoulder Internal Rotation Range of Motion, Acromiohumeral Distance, And Pain in An Adolescent Female Swimmer with Subacromial Pain (Impingement) Syndrome

Sevgi Sevi YEŞİLYAPRAK[*1], Halime Ezgi TÜRKSAN[2] and Damla KARABAY[3]

[*1]Dokuz Eylül University, Faculty of Physical Therapy and Rehabilitation, İzmir, TURKEY
[2]Dokuz Eylül University, Faculty of Physical Therapy and Rehabilitation, İzmir, TURKEY
[3]Department of Physiotherapy and Rehabilitation, Health Sciences Faculty, Izmir Katip Celebi University, Izmir, TURKEY
*Corresponding author: sevgi.subasi@deu.edu.tr

Abstract

Shoulder injuries are common in competitive youth swimmers because of sport-specific changes in upper extremity physical characteristics and acromio-humeral distance (AHD). These physical alterations could cause abnormal scapular kinematics and positioning. Subacromial pain syndrome (SPS), scapular dyskinesis, and SLAP lesions require a multiphase approach. A 14-years-old female athlete who has been swimming for 7 years had SPS symptoms for 14 months. She also had scapular dyskinesis and suspected SLAP lesion. She received 15 treatment sessions. We conducted a progressive and comprehensive rehabilitation program consisting of electrotherapy, thermal agent, mobilization techniques, posterior shoulder stretching exercises, upper and lower extremity strengthening, proprioception, scapular stabilization, and core stabilization exercises, rhythmic stabilization exercises, plyometric exercises, and the advanced thrower's 10 program. Internal rotation range of motion (IRROM) with bubble inclinometer, pain with Visual Analog Scale, and AHD with ultrasonographic imaging were assessed before treatment and at the end of the 9th and 15th treatment sessions. Before treatment, IRROM was 52°, AHD was 10.67 mm, and pain intensity at rest and during swimming was 0 and 3.1 cm, respectively. After 9 treatment sessions, IRROM was 55.6°, AHD was 11.62 mm, pain intensity at rest and during swimming was 3.7 cm and 5.1 cm, respectively. At the end of the treatment, IRROM was 58.33°, AHD was 12.02 mm, pain intensity at rest and during swimming was 0 cm. A progressive and challenging rehabilitation program may positively change the scapular and glenohumeral kinematic patterns leading to an increase in AHD and IRROM, therefore a decrease in pain.

Keywords
Subacromial Pain Syndrome, SLAP Lesion, Scapular Dyskinesis, Women Swimmers, Physical Therapy, Rehabilitation

INTRODUCTION

Shoulder injuries are common in overhead athletes including swimmers. Swimming requires numerous repetitions of the same overhead movement during training and competitions. There can be sudden increases in training load and volume. An elite swimmer older than 13 years typically performs between 0.5 and 1 million arm cycles per arm per year (Bak and Faunø, 1997; Weldon and Richardson, 2001). During overhead activities for synchronized motion, the shoulder must have adequate internal rotation (IR), external rotation (ER), and horizontal adduction range of motion (ROM), as well as strength for rotator cuff (RC), periscapular, trunk, and lower extremity muscles to perform properly coordinated kinematic patterns between the humerus, scapulae, thorax and lower extremity (Burkhart et al., 2003; Kibler et al., 2012). The repetitive nature of swimming

Received: 23 December 2021 ; **Accepted:** 25 March 2022 ; **Published:** 20 June 2022
[1]**ORCID**: 0000-0002-4592-9812, [2]**ORCID:** 0000-0003-0083-2387, [3]**ORCID**: 0000-0003-4782-2549

may fatigue the posterior RC (infraspinatus and teres minor) and periscapular muscles, which may be exposed to more stress on the posterior capsule to maintain joint stability through the swimming stroke and may lead to IRROM deficiency and narrowing of the acromiohumeral distance (AHD) (Hibberd Laudner Berkoff et al., 2016; Su et al., 2004; Torres and Gomes, 2009). The term "swimmer's shoulder" comprises the combination of hypovascularity of the RC tendons (especially supraspinatus), muscle fatigue (especially serratus anterior), poor stroke mechanics, and the progressive instability of a hypermobile glenohumeral joint, and scapular dyskinesis with subacromial pain syndrome (Bak, 2010; Kenal and Knapp, 1996; Sajadi et al., 2019). Swimmer's shoulder is common in swimming, as at least 55% of all injuries in competitive swimmers affect the shoulder (McFarland and Wasik, 1996).

The main factor in the development of a swimmer's shoulder seems to be the high training volume during growth in the absence of a balanced dryland training program (Porter et al., 2020). Most swimming strokes consist of a pull-through phase that generates speed and a recovery phase where the arm is over the water (Bak, 2010). Yanai and Hay demonstrated that impingement on average occurred 24.8% of the stroke time (Yanai and Hay, 2000). At the end of the power phase of the stroke, the arm is in adduction position, compromises blood supply to the insertion of the biceps and supraspinatus tendons (Kenal and Knapp, 1996) This repetitive hypovascularity leads to degenerative changes in these tendons, resulting in tendon pathology (Kenal and Knapp, 1996; McCreesh et al., 2017). Excessive tissue load remains the most substantial causative factor in the development of RC tendinopathy (Porter et al., 2020). The differential effect of loading on normal and symptomatic RC tendons has been investigated by McCreesh et al (McCreesh et al., 2017). They demonstrated that an RC muscle fatigue protocol leads to a short-term decrease in acromiohumeral distance (AHD) and swelling of the supraspinatus tendon in people with RC tendinopathy (McCreesh et al., 2017). Furthermore, it has been reported that decreased IRROM, deriving from bone adaptation (increased humeral retroversion) (Reagan et al., 2002) or soft tissue adaptation (posterior shoulder tightness) (Burkhart et al., 2003; Tyler et al., 2000), causes a change in glenohumeral and scapular kinematics (Burkhart et al., 2003). These kinematic alterations lead to anterior-superior translation of the humeral head and a decrease in subacromial space (Burkhart et al., 2003; Kibler et al., 2013; Maenhout et al., 2012). Muraki et al. indicated that even a small amount of narrowing of the subacromial space may cause significant changes in the subacromial contact pressure (Muraki et al., 2012). Therefore, decreases in IRROM and AHD and an increase in the subacromial contact pressure may induce pain (Burkhart et al., 2003; Desmeules et al., 2004; Maenhout et al., 2012; Navarro-Ledesma et al., 2017).

The rehabilitation program is required a multiphasic approach, consisting of the entire kinetic chain to prepare the swimmer for the high demands of overhead activity. The general rehabilitation program includes electrotherapy agents, mobilization of the shoulder and scapula complex, stretching exercises, proprioceptive exercises, dynamic stability exercises, strength training for the RC, scapulothoracic, core, and lower extremity muscles (Kibler et al., 2001; Wilk et al., 2011). We present an adolescent female swimmer who has SPS, scapular dyskinesis and suspected SLAP lesion. We aimed to investigate the effects of a comprehensive and progressive rehabilitation program on posterior shoulder flexibility, subacromial space, and pain in an adolescent female swimmer with subacromial pain syndrome. We hypothesized that a progressive and comprehensive sports-specific rehabilitation program may increase IRROM and AHD and as a result improve pain. For this purpose, we assessed shoulder IRROM, AHD, and pain.

MATERIALS AND METHODS

Participant

A 14-years-old right dominant-handed female athlete who has been swimming for 7 years. She swims with butterfly and backstroke techniques for 14 hours with a swimming distance of 40 km in a week. She was diagnosed with SPS and scapular dyskinesis 14 months ago. Furthermore, she had SLAP lesion symptoms but it was not confirmed with radiologic diagnosis. Ethical approval was obtained from the ethics committee of Dokuz Eylül University for the study to be performed (Number: 2021/20-54).

Intervention

We conducted a progressive and comprehensive rehabilitation program consisting of electrotherapy, thermal agent, mobilization techniques, posterior shoulder stretching exercises (Wilk et al., 2013), upper extremity and lower extremity strengthening, proprioception exercises, scapular stabilization and core stabilization exercises, rhythmic stabilization exercises, plyometric exercises, and the advanced thrower's 10 exercise program (Kenal and Knapp, 1996; Kibler et al., 2001; Wilk and Arrigo, 1993; Wilk et al., 2013; Wilk et al., 2011). She received 15 treatment sessions (3 times a week) including transcutaneous electrical nerve stimulation (TENS), hot pack/cold pack, mobilization of the shoulder complex and scapula, as well as proprioceptive, dynamic stability, and endurance exercises. The advanced thrower's ten program was added as the specialized and challenging rehabilitation program progressed (Kenal and Knapp, 1996; Kibler et al., 2001; Wilk and Arrigo, 1993; Wilk et al., 2013; Wilk et al., 2011).

According to our four-phased rehabilitation program, we focused on dynamic stability, coactivation, high levels of proprioceptive and neuromuscular control, strength and endurance training of the RC and scapulothoracic stabilizer muscles, as well as core and lower extremity muscles. Strengthening exercises were performed with a resistance band (Theraband®, Hygenic Corp, Ohio, USA). The individual intensity was determined by the BORG scale (RPE of 12-14) and progression was done accordingly (started with 2x10 repetitions and progressed 3x10 repetitions).

In phase I, we used TENS (20 minutes of high-frequency [50-100 Hz], low-intensity, small pulse width [50-200 μs] conventional transcutaneous electrical nerve stimulation), 20 minutes of hot-pack application before exercises, and 15 minutes of cold-pack application after exercises. Wilk's modified posterior shoulder stretching exercises (PSSE) to improve shoulder IR and horizontal adduction (Hadd) ROM through modified cross-body and modified sleeper stretching exercises were given. Furthermore, active assistive static stretching exercises for upper trapezius, serratus anterior, latissimus dorsi as well as pectoralis minor muscles and anterior capsule were performed. Active-assistive stretching exercises were performed for 15 seconds with 5 repetitions resting 5 seconds between each stretch. Proprioception training was initially performed on stable surfaces. The exercises were performed for a maximum of 30 seconds as long as the movement continued to be done with quality. We mainly focused on scapular control and coupled RC activation in phase I. Concentric strengthening exercises for both RC and scapular muscles were performed. Closed chain dynamic stabilization exercises were performed through rhythmic stabilization drills while the hand on the wall and then on the treatment table (progressed from two hand to one hand). Axial loading exercises began on a stable base of support. Side-lying planks for core endurance, lateral slides with a resistance band, single-leg squat, lunge exercises, and strengthening of the lower extremity external rotators, abductors, and extensors were performed. Progression to phase II was made if the pelvis control over the planted leg (negative Trendelenburg sign), effective hip and trunk extension, scapular control (especially of retraction), and increased posterior shouler flexibility were achieved (Kibler et al., 2001; Wilk et al., 2011).

In phase II she continued to receive electrotherapy and PSSE. We progressed isotonic strengthening of the shoulder and scapulothoracic muscles, as well as thrower's ten program. We continued rhythmic stabilization drills for both shoulders (when the shoulder was elevated 110° in the scapular plan, rhythmic stabilization drills were performed with open kinetic position) and scapula (scapular clock exercises on the wall were performed with rhythmic stabilization drills). Axial loading exercises and proprioception training progressed to an unstable surface using a stability ball and BOSU ball. For core stability training, lumbopelvic region (plank, side plank and push-ups on the knee) and lower extremity (hip extensor, abductor, and external rotator strengthening) endurance program were added.

Phase III included advanced strengthening exercises. We continued to give electrotherapy and PSSE. We focused on mainly the advanced thrower's ten program, as well as plyometric exercises for trunk and upper extremity rotation diagonals with resistance bands. According to the advanced throwers 10 exercise program, she set on a stability ball and performed IR and ER strengthening at 0° of abduction, full can exercise, and lateral raise to 90° of abduction using a resistance band or dumbbells as appropriate. Side-

Side-lying external rotation strengthening progressed to a side-plank external rotation with dumbbells. She performed prone T raises, Y raises, and row into ER on the ball with dumbbells. Ball bounce exercises were performed on the wall while the swimmer was in standing position and shoulder at 90° abduction and 90° ER. Strengthening of the core and lower extremity were progressed.

In phase IV, we continued strengthening and flexibility drills and proprioceptive training. We focused on plyometric exercises for RC, scapulothoracic, as well as core and hip muscles. Rotational diagonal exercises were performed with a resistance band. She performed ball bounce exercises both in the prone and standing position, while shoulder at 90° abduction and 90° ER.

Table 1. The rehabilitation program

Phase I
Electrotherapy agents: TENS Hot-pack Cold-pack
Stretching Exercises: • Wilk's modified posterior shoulder stretching exercises (Modified cross-body and modified sleeper stretching exercises) • Upper trapezius, serratus anterior, latissimus dorsi, pectoralis minor, anterior capsule stretching exercises
Proprioception training (on the stable surface) • Axial loading exercises (progressed from two hands to one hand) • Closed chain dynamic stabilization exercises
Strengthening exercises (Concentric) • RC and scapular muscles • Lower extremity (external rotator, abductor, and extensor lower extremity) as well as single-leg squat and lunge exercises, lateral slides with a resistance band • Side-lying planks for core endurance
Phase II
Electrotherapy agents: As in Phase I **Stretching Exercises:** As in Phase I
Neuromuscular training: • Proprioception training (on the unstable surface) • Axial loading exercises (progressed from two hands to one hand using a stability ball and BOSU ball) • Open kinetic chain dynamic stabilization exercises for shoulder (rhythmic stabilization drills were performed while the shoulder was elevated 110° in the scapular plane) and scapular rhythmic stabilization drills were performed during scapular clock exercises on the wall
Strengthening exercises (Concentric) • RC and scapular muscles, as well as lower extremity strengthening program, were progressed
The Thrower's Ten Program • PNF D2 Extension and Flexion • ER and IR at 0° of ABD • ER and IR at 90° of ABD • ABD to 90° • Full can exercise • Prone Horizontal ABD (Neutral, Full ER, 100° ABD) • Press-ups seated on a chair • Push-ups • Elbow and wrist flexion, extension • Supination, Pronation
Core stability training • Lumbo-pelvic region (plank, side plank, and push-ups on the knee) • Lower extremity (hip extensor, abductor, and ER strengthening) endurance program

Table 1. Continue

Phase III
Electrotherapy agents:
As in Phase I
Stretching Exercises:
As in Phase I
Neuromuscular training:
• Proprioception training (on the unstable surface) • Axial loading exercises (one hand using a stability and BOSU ball) • Open kinetic chain dynamic stabilization exercises for the shoulder and scapular rhythmic stabilization drills were performed during scapular clock exercises and multidirectional loading on the wall • Wall washes
Strengthening exercises (Concentric and eccentric)
Concentric exercises in Phase II was progressed Eccentric ABD and ER exercises
Core stability training
Exercises in Phase II was progressed Plyometric exercises for RC, scapulothoracic, as well as core and hip muscles, were progressed Ball bounce exercises were performed on the wall while the swimmer was in standing position and shoulder at 90° ABD and 90° ER
The advanced thrower's ten exercise program

• IR/ER with resistance band at 0° of abduction seated on a stability ball*
• Full can exercise seated on a stability ball*
• Lateral raise to 90° of ABD seated on a stability ball*
• Side-lying ER*
• T raises prone on a stability ball*
• Y raises prone on a stability ball*
• Prone row into ER on a stability ball*
• Lower Trapezius 5 Series
  • Shoulder extension in ER seated on a stability ball
  • Shoulder extension at 45° in ER seated on a stability ball
  • Standing wall circle slides
  • Standing low row
  • Standing table press-downs with scapular depression
• Biceps curls/triceps extensions seated on a stability ball
• Wrist flexion/extension and supination/pronation
*Exercises were performed with sustained holds.
Short-distance swimming program at the very end of the stage

Phase IV
Stretching Exercises:
As in Phase I
Return to activity:
Strengthening and flexibility drills and proprioceptive training were progressed in top advanced level Plyometric exercises for RC, scapulothoracic, as well as core and hip muscles, were progressed in top advanced level including rapid eccentric rotational diagonal exercises with resistance band Medicine ball plyometric exercises Plyometric push-ups Ball bounce exercises in the prone and standing position (shoulder at 90° ABD and 90° ER Swimming program at the of the stage

Outcome Measures

IRROM was assessed with a bubble inclinometer (Baseline; Fabrication End Inc., NY, USA) (Kolber and Hanney, 2010; Manske et al., 2010). In the measurement, the patient lied in a supine position, and her arm was supported with a

pillow on the table at 90° shoulder abduction, with 90° elbow flexion, and the wrist neutral. The physiotherapist placed one hand to the acromion and took the patient's arm to the maximum possible ROM with the other hand. At the end of the movement, a trained assistant placed the inclinometer on the dorsal surface of the distal forearm, read and recorded the result. Results of three repetitions were averaged (Kolber and Hanney, 2010; Manske et al., 2010). AHD was assessed with ultrasonographic imaging (LOGIQe, GE Healthcare, Wauwatosa, WI, USA) (Luque-Suarez et al., 2013). We measured the two-dimensional shortest linear distance between the anterior–inferior tip of the acromion and the humeral head via the ultrasound's on-screen calipers. We captured the images at 0º (the arm resting at the side) and then averaged the two measurement results of two locations: first, at the most anterior part of the acromial arch (confirmed with palpation) and second, 1 cm behind the first measure (Luque-Suarez et al., 2013). Pain intensity for rest and activity was assessed with Visual Analog Scale ranging from '0' indicates no pain to '10' indicates worst pain imaginable (Clark et al., 2003).

RESULTS

We assessed pain, AHD, and IRROM values before and at the end of the 9th and 15th treatment sessions. Before treatment, IRROM was 52°, AHD 10.67 mm, and pain intensity at rest and during swimming was 0 and 3.1 cm, respectively. After 9 treatment sessions, IRROM was 55.6°, AHD was 11.62 mm, pain intensity at rest and during swimming was 3.7 cm and 5.1 cm, respectively. At the end of the treatment (after 15 sessions), IRROM was 58.33°, AHD was 12.02 mm, pain intensity at rest and during swimming was 0 cm.

DISCUSSION

After a 15-session progressive and comprehensive sport-specific rehabilitation program IRROM, AHD, and pain improved in the swimmer diagnosed with SPS who has also scapular dyskinesis and suspected SLAP lesion.

During overhead activities, the shoulder must have adequate ROM, as well as coordinated proper kinematic patterns between the humerus, scapulae, and thorax for synchronized motion (Burkhart et al., 2003; Kibler et al., 2012). It has been proposed that scapular upward rotation, slight ER, and decreased anterior tilting are necessary during glenohumeral elevation to maintain the adequate size of the subacromial space (Hibberd Laudner Kucera et al., 2016; Kenal and Knapp, 1996; Maenhout et al., 2012). The inflexibility of the posterior shoulder structures, including thickened posterior capsule and glenohumeral internal rotation deficit (GIRD), acquired loss of IRROM (Burkhart et al., 2003; Harshbarger et al., 2013), has been well documented in the literature in overhead athletes having SPS. Specifically, GIRD (Torres and Gomes, 2009) and PST were reported in swimmers (Hibberd Laudner Berkoff et al., 2016). In this case, glenohumeral and scapular biomechanics can be deteriorated and lead to anterior and superior migration of the humeral head as well as scapular IR (protraction) and anterior tilting (Harryman et al., 1990; Ludewig and Cook, 2000; Lukasiewicz et al., 1999; Tyler et al., 2000). Reports on kinematic alterations give us reasons to believe that IRROM deficiency could compromise the width of the subacromial space (Atalar et al., 2009; Maenhout et al., 2012; Solem-Bertoft et al., 1993). We performed Wilk's modified PSSE to improve IR ROM (Wilk et al., 2013). IRROM improved both at the end of the 9th and 15th treatment session compared to baseline. Researchers reported that IRROM (Maenhout et al., 2012; Yamauchi et al., 2016) and AHD (Maenhout et al., 2012) improved in overhead athletes after traditional PSSE (Maenhout et al., 2012; Yamauchi et al., 2016). However, during traditional PSSEs, inadequate scapula stabilization results in accessory abduction of the scapula as the humerus goes into horizontal adduction. Furthermore, traditional cross-body stretching allows the humerus to externally rotate as the shoulder moves into the outer ranges of motion, and tension is generated in the shoulder external rotators. In contrast, modified PSSEs could isolate and more effectively stretch posterior RC, posterior capsule, and the glenohumeral ligament while providing adequate scapular stabilization without the aggravation of the shoulder pain (Wilk et al., 2013). In the first randomized controlled trial on modified PSSEs, Tahran and Yesilyaprak concluded that both modified sleeper and cross-body stretches are effective to improve GIRD, PST, and shoulder disability and function even in non-athletic patients having SPS with GIRD, over

4 weeks (Tahran and Yeşilyaprak, 2020). Recovery of normal shoulder and scapular kinematics with PSSEs by improving posterior shoulder mobility might be responsible for the improvement in IRROM therefore in AHD.

In the present study, the swimmer had a forward head and rounded shoulder posture, increased thoracic kyphosis, and an anterior tilt of the head. These postural adaptations usually occur in swimmers because of the swimming techniques and this situation contributes to the narrowing of the subacromial space (Hibberd Laudner Kucera et al., 2016). Our competitive adolescent swimmer's main techniques were butterfly and backstroke. These techniques, especially butterfly, may have contributed to these postural adaptations within the 7 years and then to scapular dyskinesis and SPS. It has been suggested that the decreased subacromial space may be due to the lack of scapular control in overhead athletes with SPS (Silva et al., 2010). Furthermore, previous researchers have demonstrated that competitive adolescent swimmers' scapula became more internally rotated, protracted, and elevated over the first 6 weeks of the training season, and they had significantly less subacromial space in both the dominant and nondominant limbs over the first 12 weeks of the training season when compared with the non-overhead athletes (Hibberd Laudner Kucera et al., 2016). These studies revealed that long-term swimming training leads to a decrease in subacromial space in swimmers. We conducted a comprehensive rehabilitation program. RC and periscapular muscle strengthening were performed through isotonic and eccentric exercises. In addition to this strengthening program, core and lower extremity exercises could contribute to improving scapular and glenohumeral kinematics to achieve better posture and leads to an increase in subacromial width assessed by AHD. Furthermore, modified PSSE can affect glenohumeral biomechanics and may contribute to IRROM gain (Kibler et al., 2001; Wilk and Arrigo, 1993; Wilk et al., 2013; Wilk et al., 2011). The advanced throwers ten program was added to our rehabilitation program when appropriate (Wilk et al., 2011). As a result, improved biomechanics may provide an increase in subacromial width and a decrease in subacromial compression in the adolescent swimmer. In parallel with our proposition, Maenhout et al. suggested a relationship between the IRROM gain and AHD improvement (Maenhout et al., 2012).

Our rehabilitation program included plyometric exercises, a combination of both eccentric and concentric exercises, especially in phase III and phase IV. The challenging rehabilitation program may explain the increase in both rest and activity pain at the end of the 9th session. However, at the end of the treatment, the pain was completely resolved. As a result of suspected SLAP lesions, instability, concordant with scapular dyskinesis as well as SPS may increase the narrowing of the AHD in the adolescent swimmer (De Martino and Rodeo, 2018; Jobe et al., 2000). The RC tendons are usually at risk for inflammation and degeneration in overhead sports due to increased load as the swimmer performs overhead movements. McCreesh et al. investigated the differential effect of loading on normal and symptomatic RC tendons and concluded that an RC muscle fatigue protocol leads to a short-term decrease in AHD and swelling of the supraspinatus tendon in people with RC tendinopathy (McCreesh et al., 2017). A combination of narrowing of AHD which creates mechanical compression and intrinsic tendon mechanism may lead to shoulder pain in swimmers (Porter et al., 2020). Continuous loading of RC tendons may result in the changes in the extracellular matrix composition affecting diameter and organization of the collagen fibers resulting in a reduced capacity to resist tensional forces and may contribute to degeneration and pain, especially in the supraspinatus tendon (Riley et al., 1994). A recent systematic review pointed out that there is no consistent pattern related to the correlation between subacromial space and pain in patients with SPS (Park et al., 2020). However, the supraspinatus tendon occupation ratio (STOR) which is the supraspinatus tendon thickness as a percentage of subacromial space, appears to be greater in patients with SPS compared to controls without shoulder pain (Park et al., 2020). After our rehabilitation program, AHD improved. Perhaps the internal structure of the tendon parallel to the improvement in AHD may have changed and STOR may have improved as well. However, because we did not measure the supraspinatus tendon thickness and calculate STOR no definitive conclusion is possible. Furthermore, IRROM improved after treatment. We performed modified PSSEs to ensure proper collagen fiber organization

and alignment for the posterior shoulder muscles and shoulder capsule. In addition to this, we conducted a specific sports rehabilitation program including the advanced thrower's ten exercise program. We increased the intensity of the exercises gradually, considering the RC tendon irritability. We aimed to provide proper loading on the RC tendon via our exercise program. We ensured an increase in the posterior shoulder flexibility with this comprehensive rehabilitation program. Gradual increase of exercise load may have provided realignment of the proper intrinsic tendon mechanism leading to improvement of STOR. Periarticular connective tissues, based on the biological principle, remodel over time in response to the type and proper amount of physical stress they receive and this may lead to an increase in the IRROM. Soft tissue remodeling along the lines of imparted stress, also known as plastic deformation, occurs when microtrauma at the cellular level breaks cross-links of the periarticular connective tissue thereby creating elongation of collagen bundles (Manske et al., 2013). Consistent with the literature, we performed 15 sessions of modified PSSE (Manske et al., 2010; McClure et al., 2007; Tahran and Yeşilyaprak, 2020). This number of treatment sessions seems to be sufficient to create the abovementioned changes.

Conclusion

A comprehensive progressive sport-specific rehabilitation improved IRROM and AHD, and resolved the pain in the swimmer with SPS, scapular dyskinesis, and suspected SLAP lesion. The effects of our treatment program on IRROM, AHD, and pain in a larger sample of women swimmers with similar demographic characteristics and diagnoses should be investigated.

Acknowledgment

The authors express their gratitude to the swimmer who participated in the study.

Conflict of interests

The authors have no conflict of interests to declare. No financial support was received for this study.

Ethics Statement

Ethical approval was obtained from the ethics committee of Dokuz Eylül University for the study to be performed (Number: 2021/20-54). In addition, verbal and written informed consent was obtained from the family of the female swimmer who is under 18 years of age. Nevertheless, we also obtained verbal consent from herself.

Author Contributions

Study Design, SSY; Data Collection, HET, DK; Data Interpretation, SSY, HET; Manuscript Preparation, SSY, HET, DK; Literature Search, SSY, HET, DK. All authors have read and agreed to the published version of the manuscript.

REFERENCES

Atalar, H., Yilmaz, C., Polat, O., Selek, H., Uraş, I., & Yanik, B. (2009). Restricted scapular mobility during arm abduction: implications for impingement syndrome. *Acta Orthop Belg, 75*(1), 19-24.

Bak, K. (2010). The practical management of swimmer's painful shoulder: etiology, diagnosis, and treatment. *Clin J Sport Med, 20*(5), 386-390.

Bak, K., & Faunø, P. (1997). Clinical findings in competitive swimmers with shoulder pain. *Am J Sports Med, 25*(2), 254-260.

Burkhart, S. S., Morgan, C.D., & Kibler, W. B. (2003). The disabled throwing shoulder: spectrum of pathology Part I: pathoanatomy and biomechanics. *Arthroscopy, 19*(4), 404-420.

Clark, P., Lavielle, P., & Martínez, H. (2003). Learning from pain scales: patient perspective. *J Rheumatol, 30*(7), 1584-1588.

De Martino, I., & Rodeo, S. A. (2018). The Swimmer's Shoulder: Multi-directional Instability. *Curr Rev Musculoskelet Med, 11*(2), 167-171.

Desmeules, F., Minville, L., Riederer, B., Côté, C. H., & Frémont, P. (2004). Acromio-humeral distance variation measured by ultrasonography and its association with the outcome of rehabilitation for shoulder impingement syndrome. *Clin J Sport Med, 14*(4), 197-205.

Harryman, D.T., 2nd, Sidles, J.A., Clark, J. M., McQuade, K.J., Gibb, T.D., & Matsen, F. A., 3rd. (1990). Translation of the humeral head on the glenoid with passive glenohumeral motion. *J Bone Joint Surg Am, 72*(9), 1334-1343.

Harshbarger, N.D., Eppelheimer, B.L., Valovich McLeod, T.C., & Welch McCarty, C. (2013). The effectiveness of shoulder stretching and joint mobilizations on posterior shoulder tightness. *J Sport Rehabil, 22*(4), 313-319.

Hibberd, E.E., Laudner, K., Berkoff, D.J., Kucera, K.L., Yu, B., & Myers, J.B. (2016). Comparison of Upper Extremity Physical Characteristics Between Adolescent Competitive Swimmers and Nonoverhead Athletes. *J Athl Train, 51*(1), 65-69.

Hibberd, E.E., Laudner, K.G., Kucera, K. L., Berkoff, D.J., Yu, B., & Myers, J. B. (2016). Effect of Swim Training on the Physical Characteristics of Competitive Adolescent Swimmers. *Am J Sports Med, 44*(11), 2813-2819.

Jobe, C.M., Coen, M.J., & Screnar, P. (2000). Evaluation of impingement syndromes in the overhead-throwing athlete. *J Athl Train, 35*(3), 293-299.

Kenal, K.A., & Knapp, L.D. (1996). Rehabilitation of injuries in competitive swimmers. *Sports Med, 22*(5), 337-347.

Kibler, W.B., Kuhn, J. E., Wilk, K., Sciascia, A., Moore, S., & Laudner, K. (2013). The disabled throwing shoulder: spectrum of pathology-10-year update. *Arthroscopy, 29*(1), 141-161.e126.

Kibler, W.B., McMullen, J., & Uhl, T. (2001). Shoulder rehabilitation strategies, guidelines, and practice. *Orthop Clin North Am, 32*(3), 527-538.

Kibler, W.B., Sciascia, A., & Thomas, S. J. (2012). Glenohumeral internal rotation deficit: pathogenesis and response to acute throwing. *Sports Med Arthrosc Rev, 20*(1), 34-38.

Kolber, M.J., & Hanney, W.J. (2010). The reliability, minimal detectable change and construct validity of a clinical measurement for identifying posterior shoulder tightness. *N Am J Sports Phys Ther, 5*(4), 208-219.

Ludewig, P.M., & Cook, T.M. (2000). Alterations in shoulder kinematics and associated muscle activity in people with symptoms of shoulder impingement. *Phys Ther, 80*(3), 276-291.

Lukasiewicz, A.C., McClure, P., Michener, L., Pratt, N., & Sennett, B. (1999). Comparison of 3-dimensional scapular position and orientation between subjects with and without shoulder impingement. *J Orthop Sports Phys Ther, 29*(10), 574-583; discussion 584-576.

Luque-Suarez, A., Navarro-Ledesma, S., Petocz, P., Hancock, M.J., & Hush, J. (2013). Short term effects of kinesiotaping on acromiohumeral distance in asymptomatic subjects: a randomised controlled trial. *Man Ther, 18*(6), 573-577.

Maenhout, A., Van Eessel, V., Van Dyck, L., Vanraes, A., & Cools, A. (2012). Quantifying acromiohumeral distance in overhead athletes with glenohumeral internal rotation loss and the influence of a stretching program. *Am J Sports Med, 40*(9), 2105-2112.

Manske, R., Wilk, K.E., Davies, G., Ellenbecker, T., & Reinold, M. (2013). Glenohumeral motion deficits: friend or foe? *Int J Sports Phys Ther, 8*(5), 537-553.

Manske, R.C., Meschke, M., Porter, A., Smith, B., & Reiman, M. (2010). A randomized controlled single-blinded comparison of stretching versus stretching and joint mobilization for posterior shoulder tightness measured by internal rotation motion loss. *Sports Health, 2*(2), 94-100.

McClure, P., Balaicuis, J., Heiland, D., Broersma, M.E., Thorndike, C.K., & Wood, A. (2007). A randomized controlled comparison of stretching procedures for posterior shoulder tightness. *J Orthop Sports Phys Ther, 37*(3), 108-114.

McCreesh, K.M., Purtill, H., Donnelly, A.E., & Lewis, J. S. (2017). Increased supraspinatus tendon thickness following fatigue loading in rotator cuff tendinopathy: potential implications for exercise therapy. *BMJ Open Sport Exerc Med, 3*(1), e000279.

McFarland, E.G., & Wasik, M. (1996). Injuries in female collegiate swimmers due to swimming and cross training. *Clin J Sport Med, 6*(3), 178-182.

Muraki, T., Yamamoto, N., Zhao, K.D., Sperling, J. W., Steinmann, S. P., Cofield, R.H., & An, K.-N. J. J. o. s. (2012). Effects of posterior capsule tightness on subacromial contact behavior during shoulder motions. *Journal of shoulder elbow surgery 21*(9), 1160-1167.

Navarro-Ledesma, S., Struyf, F., Labajos-Manzanares, M.T., Fernandez-Sanchez, M., Morales-Asencio, J. M., & Luque-Suarez, A. (2017). Does the acromiohumeral distance matter in chronic rotator cuff related shoulder pain? *Musculoskelet Sci Pract, 29*, 38-42.

Park, S. W., Chen, Y.T., Thompson, L., Kjoenoe, A., Juul-Kristensen, B., Cavalheri, V., & McKenna, L. (2020). No relationship between the acromiohumeral distance and pain in adults with subacromial pain syndrome: a systematic review and meta-analysis. *Sci Rep, 10*(1), 20611.

Porter, K.N., Blanch, P.D., Walker, H.M., & Shield, A. J. (2020). The effect of previous shoulder

pain on supraspinatus tendon thickness changes following swimming practice. *Scand J Med Sci Sports, 30*(8), 1442-1448.

Reagan, K.M., Meister, K., Horodyski, M. B., Werner, D.W., Carruthers, C., & Wilk, K. (2002). Humeral retroversion and its relationship to glenohumeral rotation in the shoulder of college baseball players. *Am J Sports Med, 30*(3), 354-360.

Riley, G.P., Harrall, R.L., Constant, C.R., Chard, M. D., Cawston, T. E., & Hazleman, B. L. (1994). Glycosaminoglycans of human rotator cuff tendons: changes with age and in chronic rotator cuff tendinitis. *Ann Rheum Dis, 53*(6), 367-376.

Sajadi, N., Alizadeh, M.H., Barati, A.H., & Minoonejad, H. (2019). Effect of Selected Corrective Exercises on Glenohumeral Internal Rotation in Female Adolescent Swimmers with Scapular Dyskinesis. *J Annals of Military Health Sciences Research, 17*(4).

Silva, R.T., Hartmann, L.G., Laurino, C.F., & Biló, J.P. (2010). Clinical and ultrasonographic correlation between scapular dyskinesia and subacromial space measurement among junior elite tennis players. *Br J Sports Med, 44*(6), 407-410.

Solem-Bertoft, E., Thuomas, K.A., & Westerberg, C.E. (1993). The influence of scapular retraction and protraction on the width of the subacromial space. An MRI study. *Clin Orthop Relat Res*(296), 99-103.

Su, K.P., Johnson, M.P., Gracely, E.J., & Karduna, A.R. (2004). Scapular rotation in swimmers with and without impingement syndrome: practice effects. *Med Sci Sports Exerc, 36*(7), 1117-1123.

Tahran, Ö., & Yeşilyaprak, S. S. (2020). Effects of Modified Posterior Shoulder Stretching Exercises on Shoulder Mobility, Pain, and Dysfunction in Patients With Subacromial Impingement Syndrome. *Sports Health, 12*(2), 139-148.

Torres, R. R., & Gomes, J. L. (2009). Measurement of glenohumeral internal rotation in asymptomatic tennis players and swimmers. *Am J Sports Med, 37*(5), 1017-1023.

Tyler, T.F., Nicholas, S.J., Roy, T., & Gleim, G. W. (2000). Quantification of posterior capsule tightness and motion loss in patients with shoulder impingement. *Am J Sports Med, 28*(5), 668-673.

Weldon, E.J., 3rd, & Richardson, A.B. (2001). Upper extremity overuse injuries in swimming. A discussion of swimmer's shoulder. *Clin Sports Med, 20*(3), 423-438.

Wilk, K.E., & Arrigo, C. (1993). Current concepts in the rehabilitation of the athletic shoulder. *J Orthop Sports Phys Ther, 18*(1), 365-378.

Wilk, K. E., Hooks, T. R., & Macrina, L.C. (2013). The modified sleeper stretch and modified cross-body stretch to increase shoulder internal rotation range of motion in the overhead throwing athlete. *J Orthop Sports Phys Ther, 43*(12), 891-894.

Wilk, K.E., Yenchak, A.J., Arrigo, C.A., & Andrews, J.R. (2011). The Advanced Throwers Ten Exercise Program: a new exercise series for enhanced dynamic shoulder control in the overhead throwing athlete. *Phys Sportsmed, 39*(4), 90-97.

Yamauchi, T., Hasegawa, S., Nakamura, M., Nishishita, S., Yanase, K., & Fujita, K. (2016). Effects of two stretching methods on shoulder range of motion and muscle stiffness in baseball players with posterior shoulder tightness: a randomized controlled trial. *J Shoulder Elbow Surg, 25*(9), 1395-1403.

Yanai, T., & Hay, J.G. (2000). Shoulder impingement in front-crawl swimming: II. Analysis of stroking technique. *Med Sci Sports Exerc, 32*(1), 30-40.

How to cite this article: Yeşilyaprak, S.S., Türksan, H.E. and Karabay, D. (2022). Effects of A Progressive Rehabilitation Program On Shoulder Internal Rotation Range Of Motion, Acromiohumeral Distance, And Pain In An Adolescent Female Swimmer With Subacromial Pain (Impingement) Syndrome. *Int J Disabil SportsHealth Sci*;5(1):56-65.https://doi. org/ 10.33438 /ijdshs.1041097.

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

RESEARCH ARTICLE

Sensory Integration Based Program Developed According to the Model of Creative Ability in an Individual with Schizophrenia: An Occupational Therapy Case Report

Gülşah ZENGİN[*1], Muhammed Rohat YAZICI[2] and Meral HURİ[3]

[1]Nevşehir Hacı Bektaş Veli University, Kozaklı Vocational School, Therapy and Rehabilitation Department, Nevşehir, Turkey
[2]Üsküdar University, Faculty of Healthy Sciences, Occupational Therapy Department, İstanbul, Turkey
[3]Hacettepe University, Faculty of Healthy Sciences, Occupational Therapy Department, Ankara, Turkey
*Corresponding author: gulsahzengiin@gmail.com

Abstract

Schizophrenia is a serious brain disease that causes individuals to be unable to distinguish between real and unreal phenomena, preventing healthy thought flow, emotion control and normal behavior. Symptoms of schizophrenia that begin at an early age are accompanied by positive symptoms, negative symptoms, and cognitive symptoms. Understanding the neurological processes accompanying clinical symptoms in schizophrenia is of great importance in terms of defining, researching, and improving mental health disorders The aim of the present study was to examine the effect of a sensory-based occupational therapy intervention developed according to the Vona du Toit Model of Creative Ability on the clinical symptoms and sensory processing skills of an individual with schizophrenia. Creative ability level was evaluated with Model of Creative Ability, positive and negative symptoms as clinical symptoms were evaluated with Positive and Negative Symptom Scale, and cognitive symptoms as other clinical symptoms were evaluated with Mini Mental State Exemination, and sensory processing process were evaluated with Adolesan/ Adult Sensory Profile. Evaluations were applied twice, before and after the intervention. According to the results of the research, it was observed that the 8-week occupational therapy intervention applied to the patient with schizophrenia reduced clinical symptoms and improved sensory processing skills and creative abilities. This study showed that when an individual with schizophrenia is supported with a developmental occupational therapy program that includes sensory integration-based behaviors and abilities, sensory processing skills, positive and negative symptoms, cognitive symptoms, and creative ability levels improve.

Keywords
Schizophrenia, Sensory Integration, Creative Ability, Occupational Therapy

INTRODUCTION

Schizophrenia is a mental health disorder with a very old history, which limits the participation of individuals in daily life activities and affects well-being (McCutcheon et al., 2020). Schizophrenia is one of the most challenging neuropsychiatric diseases in which the individual's interpersonal communication and interaction skills deteriorate, the person moves away from the real world, and significant problems occur in emotions, thoughts and behaviors (Pettersson-Yeo et al., 2011).

Schizophrenia has a prevalence of 3/1000 people in the World (Simeone et al., 2015). Unlike the world prevalence, the prevalence of schizophrenia in Turkey was found to be 9/1000 people (Utz et al., 2019). Today, it is known that one out of every 250 people has schizophrenia, and it is expected that one of every 140 babies born in the 21st century will develop schizophrenia in the future (Barlati et al., 2019). Considering these high rates, protective and adaptive approaches to

Received: 06 April 2022 ; **Accepted:** 08 June 2022; **Published:** 20 June 2022
[1]**ORCID**: 0000-0003-3348-5422, [2]**ORCID**: 0000-0002-3150-0433, [3]**ORCID**: 0000-0002-8738-9594

individuals with schizophrenia in the changing social structure are of great importance (Batalla-Martín et al., 2020).

Symptoms of schizophrenia that begin at an early age are accompanied by positive symptoms, negative symptoms and cognitive symptoms (Correll & Schooler, 2020; Galderisi et al., 2018). Positive symptoms include hallucinations, delusions, and disorganized thoughts and behaviors that are not present in other individuals and express an excess of normal functions. On the other hand, it appears as a lack of emotion, thought and verbal communication, which is seen as the absence of typical functions (Bighelli et al., 2018). Cognitive symptoms have started to take an important place in schizophrenia in recent years. Impaired attention, verbal fluency, and wakefulness-related impairment in executive functions are cognitive symptoms seen in schizophrenia (Tripathi et al., 2018). Understanding the neurological processes accompanying clinical symptoms in schizophrenia is of great importance in terms of defining, researching and improving mental health disorders. Sensory processing disorders are a neurobiological disorder characterized by the level of sensitivity to sensory stimuli. Understanding the neurobiological systems involved in sensory processing is important for developing appropriate intervention approaches (Kanchanatawan et al., 2018; Koola, 2018).

Research shows that people with schizophrenia have sensory processing problems. Sensory processing disorders aggravate the clinical symptoms (positive symptoms, negative symptoms and cognitive symptoms) caused by the disease in individuals with schizophrenia (Abaoğlu, 2022). This situation causes negative results in terms of symptomatic and functional aspects. It is known that the personal care of individuals, their participation in daily life activities and their quality of life are adversely affected. Therefore, until sensory processing disorders can be effectively treated, clinicians and caregivers need to be aware of individuals' ability to communicate effectively with the environment (Acevedo et al., 2018).

Occupational therapy models give occupational therapists the opportunity to apply assessment and intervention methods that require communication and interaction skills with the environment with a holistic perspective (O'Brien & Kuhaneck, 2019; Larsson-Lund & Nyman, 2017; Güney Yılmaz et al., 2021). Vona du Toit Model of Creative Ability (VdTMoCA) provides occupational therapists with a developmental perspective, a frame of reference for the evaluation of personal, social and work-related recreational activity performance areas that emerge as a result of people's interaction with the environment (Van der Reyden et al., 2019). From a developmental perspective, each creative ability level consists of interrelated will, motivation, and action (behaviors, ability, and performance) (Sherwood, 2011). Ability levels may decline due to illness, trauma, injury or changing life demands. Creative abilities according to the model deals with four occupational performance areas: personal management (self care and management of one's belonging and finances), social ability (relating people), work ability (ability to be productive in relation to roles; dependent upon concept formation and task consept), and use of leisure (Casteleijn, 2014; Sherwood, 2011). VdTMoCA provides occupational therapists with guidance for intervention by determining treatment priorities in the light of assessments, establishing principles for treatment goals appropriate to the individual's level, and defining expectations for performance. VdTMoCA is also very suitable for studies with heterogeneous groups in terms of age, diagnosis and culture (de Witt, 2014; Casteleijn & de Vos, 2007).

The aim of the present study was to examine the effect of a sensory-based occupational therapy intervention developed according to the Vona du Toit Model of Creative Ability on the clinical symptoms of schizophrenia and sensory processing skills in an inpatient with schizophrenia in a psychiatric hospital.

MATERIALS AND METHODS

A man with schizophrenia who was treated as an inpatient at the Private Lape Hospital was included in our study. The 45-year-old patient was diagnosed with schizophrenia in 2007 and has been hospitalized four times since then. The last attack occurred in 2019 and he has been inpatient treatment in a psychiatric hospital for about three months. The case was referred to occupational therapy because of being closed to communication and interaction with the environment and unable to perform self-care activities. An informed consent form was obtained from the individual before the

study. Vona du Toit Model of Creative Ability was used to evaluate the case from a developmental perspective and to create an intervention program. Thus, based on the creative ability level of the case, an intervention program suitable for the developmental level was created.

Vona du Toit Model of Creative Ability (VdTMoCA)

The model developed by Vona du Toit in South Africa in 1960, provides a developmental frame of reference in occupational therapy practice (Casteleijn, 2014). VdTMoCA enables occupational therapists to evaluate individuals and determine their occupational performance, and to guide the intervention program through the using graded purposeful activities. According to the model, a graded intervention program should be used to eliminate the problems that arise in personal management, social ability, work ability and use of leisure, which are four occupational performance areas that show the behavior and abilities of individuals. This model is particularly suitable for evaluating individuals with mental health disorders and establishing a treatment program (Casteleijn, 2014; Sherwood, 2011).

Adolescent/Adult Sensory Profile (AASP)

AASP is a scale consisting of 60 items. Evaluates the response of 6 sensory models to different sensory stimuli. It is used in adolescents and adults aged 11 and over. The Sensory Profile has 60 items, divided equally into 15 items, divided into four categories, each belonging to a different sensory processing pattern: (1) Low Registration, (2) Sensory Seeking, (3) Sensory Sensitivity, and (4) Sensory Avoiding. Using a five-item Likert scale, participants are asked to rate how often they respond to the sensory event/experience described in each item. Scores in each category result in a range of 5 to 75 points. Each age group (11-18, 18-65 and 65 and over) has different norm values. The higher the score, the more traits the individual exhibits for sensory processing patterns. For example, the higher the individual's score in the "low registration" model, the stronger the individual's tendency to not register sensory stimuli (Engel-Yeger, 2012). Turkish adaptation of the test made by in 2015 (Aydın et al., 2015).

Positive and Negative Symptom Scale (PANSS)

PANSS was used to evaluate the positive and negative symptoms of the participants with schizophrenia in our study. This interview was developed by Kay et al to evaluate positive symptoms, negative symptoms and general psychopathology (Kay et al., 2012). The symptoms seen in the person in the last week are taken into account. The PANSS is scored between 1-7 points. The evaluation period takes 30-40 minutes on average. your scale. Turkish validity and reliability were done by Kostakoğlu et al. (1999).

Mini Mental State Exemination (MMSE)

MMSE is a scale used to evaluate the cognitive status of individuals. Test; It evaluates verbal responses including attention, orientation and memory, ability to obey verbal and written orders, write spontaneous sentences, and copy a complex drawing. The cut-off value of this scale, which consists of a total of 30 points, is 24 points. Values below 24 indicate deterioration in cognitive status. The reliability and validity studies of the Turkish version of the MMDT were performed by Güngen et al. in 2002 (Lewis, 1994; Güngen et al., 2002).

Intervention Goals

According to the results of the initial evaluation of the case, the level of action determined by VdTMoCA was determined in accordance with the level of "destructive action" (Table 1).

Configuring the Intervention Program

The intervention program was created for the solution of the problem areas identified according to the evaluation tests and VdTMoCA. The intervention program was developed according to the occupational therapy practice model, VdTMoCA. The intervention program was carried out in short sessions of 10-20 minutes, twice a week for 2 months. The sessions were held in the hospital room and in the familiar environment inside the hospital. The sessions were repeated twice a day. Multi Model Sensory Stimulation Programs were used in the intervention program (Table 2). This program is a sensory-based approach developed to stimulate the seven senses (visual, hearing, tactile, taste, smell, vestibular and proprioceptive senses).

Table 1: Intervention goals set for the case.

Occupational Performance Area	Goals
Personal Management	Stimulating brain functions by increasing awareness of the senses Development of gross motor skills Stimulate body awareness Stimulate cognitive functions
Social Ability	Stimulating place, time and person orientation Stimulate memory Appease restless behavior Focused attention for a short time
Work ability and use of leisure	To interact constructively with objects and materials for a short period of time Since the person does not have the concept of leisure at this level, after gaining personal management abilities and social abilities, the focus will be on performance in this area.

Table 2: Sample activities for the multi-model sensory stimulation program.

Sense-Based Approach Example	Stimulated Sensory System
The use of all materials to be used during the session was demonstrated at the beginning of the session.	Proprioceptive, Visual
The scent of the room was changed with comforting room fragrances such as lavender	Smell
Sessions requiring physical activity were supported with rhythmic music.	Hearing, Vestibular
It was made to touch objects of different textures (soft/hard fabrics, cotton, and cloths, etc.)	Tactile
Activities for the development of gross motor skills were planned (walking in familiar surroundings (hospital corridor).	Vestibular, Proprioceptive
Tooth brushing activity was studied with a mint flavored toothpaste.	Taste and smell

RESULTS

Findings of Creative Abilities

Determining the creative ability level takes place in three steps: (1) Evaluating behavior and abilities, (2) determining the action level, and (3) determining the motivation level.

Step 1 - Evaluation of behavior and abilities: According to the results of clinical observations and interviews with the patient's doctor and nurse within the scope of VdTMoCA, the behavior and abilities are as follows in the initial assessment:

When the individual's personal management abilities are examined, it is seen that he has not yet been able to perform self-care activities on his own. For example, during the toothbrushing activity, the person comes into contact with toothpaste, toothbrush and water; however, even if the toothpaste tastes bad, he may try to eat it. Therefore, self-care needs are met by the caregiver.

When the social abilities of the individual are examined, they can distinguish their caregivers, therapist, and doctor. However, this distinction is in the form of familiar and unfamiliar person. They can take simple commands such as "sit", "stand up", "do". His speech is still negligible; however, when he is disturbed, he gives reactions such as grunts. Therefore, yes-no papers and smiley-sad face expression papers are used to communicate.

When the individual's working abilities and leisure use are examined, the ability to use objects has not yet developed, so it is not possible to work in a paid or unpaid job. The concept of leisure does not yet exist.

Steps 2 and 3 - Determining the level of action and motivation: According to the VdTMoCA, the motivation level of the individual with schizophrenia was "Self Differentiation-Person Oriented Phase" before the intervention, but "Passive Participation-Transition Phase" after the intervention, according to the results of the creative ability level evaluation of the individual with schizophrenia.

Findings on Sensory Processing Skills

According to the AASP results, when the pre-intervention and post-intervention sensory processing skills were compared, it was observed that there were improvements. While there was a possible difference before the intervention in the low registration, sensory sensitivity and sensory avoidance quadrants, the post-intervention case showed typical performance. In sensory seeking, both pre-intervention and post-intervention cases showed typical performance. Changes in sensory processing processes after sensory-based occupational therapy intervention are given in Table 3.

Table 3: Change in sensory processing skills.

	Pre-Intervention	Post Intervention	Typical Performance
Low Registration	36	31	24-35
Sensory Seeking	45	52	43-56
Sensory Sensitivity	42	38	26-41
Sensory Avoiding	44	35	27-41

Findings Regarding Positive and Negative Symptoms

According to the PANSS results, when the patient's positive symptom, negative symptom and general psychopathology scores, which are the clinical symptoms of schizophrenia before and after the intervention, were compared, improvements were observed (Table 4).

Table 4: Change in positive and negative symptoms.

	Pre-Intervention	Post Intervention
Positive Symptoms	12	10
Negative Symptoms	18	13
General Psychopathology	30	26
PANSS Total	60	49

PANSS: Positive and Negative Symptom Scale

Findings on Cognitive Symptoms

When the pre-intervention and post-intervention cognitive functions were compared according to the MMSE results, it was observed that there were improvements in all areas. Changes in cognitive symptoms after sensory-based occupational therapy intervention are given in Table 5.

Table 5: Change in cognitive symptoms

	Pre-Intervention	Post Intervention
Orientation	2	5
Registration Memory	1	2
Attention and Calculation	1	2
Recall	1	2
Language	3	5
MMSE Total	8	16

MMSE: Mini Mental State Exemination

DISCUSSION

In our study, the effect of sensory-based occupational therapy intervention on clinical symptoms of schizophrenia (positive symptom, negative symptom and cognitive symptom), sensory processing skills and creative ability level in an individual with schizophrenia was investigated. At the end of two months, it was observed that there were positive and significant improvements in the creative ability level, sensory processing skills and clinical symptoms of the individual with schizophrenia.

According to our study results, it was observed that the creative ability level, which is an indicator of behavior and abilities, improved with the occupational therapy intervention program based on sensory integrity. When the literature was reviewed, occupational therapists used VdTMoCA to assess creative ability. Samsonraj et al. (2012) measured the effectiveness of the interventions of occupational therapists working in mental health with assessment measures such as Canadian Activity Performance Measurement and VdTMoCA. In another study using VdTMoCA, Silaule (2017) evaluated the activity participation of 64 people who received mental health services and were hospitalized. In the study, the changes in the creative ability levels of the people were determined by evaluating the behaviors and abilities. When the literature is examined, it is seen that VdTMoCA is used as a tool to evaluate creative abilities. Creative ability level is a result and measurement of behavior and abilities and is difficult to evaluate (Ratelle et al., 2004). However, no evidence-based study has been found that examines the creative ability level of individuals with schizophrenia. We think that the result of this research will guide the intervention programs to be prepared for individuals with schizophrenia.

Although it is known that sensory integrity approaches improve sensory processing disorders; this study showed that sensory-based occupational therapy approaches to reduce clinical symptoms and sensory processing disorders reduce the sensory problems of individuals with schizophrenia.When the literature is examined, it is seen that individuals with schizophrenia have disorders in their sensory processing skills (Brown et al., 2002; Meredith et al., 2020; Engel-Yeger, 2011; Zengin & Huri, 2020). Brown et al. (2002), in their study comparing the sensory processing processes of individuals with schizophrenia and healthy individuals, found that the sensory seeking scores of individuals with schizophrenia were worse than those of healthy individuals. Meredith et al. (2020), alcohol, drugs, cigarettes, etc. In the study in which 223 people who use drugs examined the relationship between their sensory sensitivity and insecure attachment, it was observed that individuals with substance use disorder experienced sensory sensitivity problems. In his study, Engel-Yeger (2011) compared the sensory processing processes of 145 individuals with substance use disorder who had been under treatment for at least 3 months with healthy individuals, and found that the sensory sensitivity and sensory avoidance areas of individuals with substance use disorder were weaker than healthy individuals. Rieke and Anersen (2009), in their study comparing the sensory processing processes of individuals with obsessive compulsive disorder and healthy individuals, again identified problems in the areas of sensory sensitivity and sensory avoidance.

Occupational therapists use behavioral strategies to reduce the positive and negative symptoms of individuals with schizophrenia. In addition, there are very few studies showing a relationship between positive and negative symptoms and sensory functions. While positive symptoms occur as deviations in normal functions such as delusions and hallucinations, negative symptoms are seen as decreases in the content of emotions and thoughts, and it is clearly stated in the literature that positive and negative symptoms are frequently seen in individuals with schizophrenia (Öztürk & Uluşahin, 2014). Mason and Brady (2009) stated that when individuals prone to psychosis are deprived of sensory input even for a short time, their hallucinations and paranoia increase, and even those who are not prone to psychosis have deterioration in their thinking. Positive symptoms include hallucinations and hallucinations (Mason & Brady, 2009). When the literature is examined, the results of the research show that even mentally healthy individuals have difficulty in distinguishing internal thoughts and external events when they are deprived of sensory input, thus abnormal perceptual experiences such as hallucinations and delusions occur (Scheewe et al., 2013). In another study, it is shown that individuals with

schizophrenia who are deprived of sensory input display abnormal behaviors and negative symptoms such as slowing down in their energy and speech occur (Robinowitz et al., 2012). In our study, it was observed that the sensory-based approach to improve sensory processing processes in schizophrenia also reduced positive and negative symptoms. This may be due to the fact that sensory processing processes are associated with positive and negative symptoms. However, evidence-based studies are needed in this regard.

In our study, reductions in cognitive symptoms were observed with sensory-based occupational therapy intervention in individuals with schizophrenia. It is known that one of the clinical symptoms seen in individuals with schizophrenia is cognitive symptoms (Correll & Schooler, 2020). Cognitive symptoms seen in individuals with schizophrenia are seen as a range of perceptual problems, including problems with memory problem solving and processing auditory and visual stimuli. The perception process emerges with the integration of the sensory stimuli we receive from the environment and our body in the brain (Shiraishi & Reilly, 2009). This explains the reduction of cognitive symptoms with sensory integration-based occupational therapy intervention.

CONCLUSION

The purpose of sensory integration programs developed by occupational therapists is to get better the behavior and abilities of individuals. This study showed that when an individual with schizophrenia is supported with a developmental occupational therapy program that includes sensory integration-based behaviors and abilities, sensory processing skills, positive and negative symptoms, cognitive symptoms, and creative ability levels improve. Randomized controlled studies with large sample groups are recommended to increase the level of evidence and to support the dissemination of developmental frame of reference-based rehabilitation programs such as VdTMoCA in individuals with schizophrenia by occupational therapists.

Acknowledgment

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

Conflict of interests

The authors have no conflict of interests to declare. No financial support was received for this study.

Informed Consent Form

Verbal and written informed consent was obtained from the caregiver of the male inpatient and himself who is 45 years of age.

Author Contributions

Study Design, GZ; Data Collection, GZ, MRY; Data Interpretation, MRY, MH; Manuscript Preparation, GZ, MRY, MH; Literature Search, GZ, MRY, MH. All authors have read and agreed to the published version of the manuscript.

REFERENCES

Abaoğlu, H. (2022). *Occupational Therapy in Schizophrenia*. Hipokrat Kitabevi. ISBN: 978-625-7399-34-0.

Acevedo, B., Aron, E., Pospos, S., & Jessen, D. (2018). The functional highly sensitive brain: a review of the brain circuits underlying sensory processing sensitivity and seemingly related disorders. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *373*(1744), 20170161.

Barlati, S., Deste, G., Gregorelli, M., & Vita, A. (2019). Autistic traits in a sample of adult patients with schizophrenia: prevalence and correlates. *Psychological Medicine*, *49*(1), 140-148.

Batalla-Martín, D., Belzunegui-Eraso, A., Miralles Garijo, E., Martínez Martín, E., Romaní Garcia, R., Heras, J.S.M., & Martorell-Poveda, M.A. (2020). Insomnia in schizophrenia patients: Prevalence and quality of life. *International journal of environmental research and public health*, *17*(4), 1350.

Bighelli, I., Salanti, G., Huhn, M., Schneider Thoma, J., Krause, M., Reitmeir, C., & Leucht, S. (2018). Psychological interventions to reduce positive symptoms in schizophrenia: Systematic review and network meta-analysis. *World psychiatry*, *17*(3), 316-329.

Brown, C., Cromwell, R. L., Filion, D., Dunn, W., & Tollefson, N. (2002). Sensory processing in schizophrenia: Missing and avoiding information. *Schizophrenia research*, *55*(1-2), 187-195.

Camp, A. L. (2015). The responsiveness and relevance of the activity participation

outcome measure in patients with traumatic brain injury in an acute neurological rehabilitation setting. *Johannesburg: University of the Witwatersrand*.

Casteleijn, D. (2014). Using measurement principles to confirm the levels of creative ability as described in the Vona du Toit Model of Creative Ability. *South African Journal of Occupational Therapy*, *44*(1), 14-19.

Casteleijn, D., & de Vos, H. (2007). The model of creative ability in vocational rehabilitation. *Work*, *29*(1), 55-61.

Correll, C. U., & Schooler, N. R. (2020). Negative symptoms in schizophrenia: A review and clinical guide for recognition, assessment, and treatment. *Neuropsychiatric disease and treatment*.

de Witt, P. (2014). Creative ability: A model for individual and group occupational therapy for clients with psychosocial dysfunction. *Occupational therapy in psychiatry and mental health*, 3-32.

Engel-Yeger, B. (2012). Validating the Adolescent/Adult Sensory Profile and examining its ability to screen sensory processing difficulties among Israeli people. *British Journal of Occupational Therapy*, *75*(7), 321-329.

Engel-Yeger, B., & Ziv-On, D. (2011). The relationship between sensory processing difficulties and leisure activity preference of children with different types of ADHD. *Research in developmental disabilities*, *32*(3), 1154-1162.

Galderisi, S., Mucci, A., Buchanan, R. W., & Arango, C. (2018). Negative symptoms of schizophrenia: new developments and unanswered research questions. *The Lancet Psychiatry*, *5*(8), 664-677.

Güney Yılmaz, G., Zengin, G., Temuçin, K., Aygün, D., & Akı, E. (2021). How the occupational balance of healthcare professionals changed in the COVID-19 pandemic: A mixed design study. *Australian Occupational Therapy Journal*, *68*(6), 520-534.

Güngen, C., Ertan, T., Eker, E., Yaşar, R., & Engin, F. (2002). Reliability and validity of the standardized Mini Mental State Examination in the diagnosis of mild dementia in Turkish population. *Turkish Journal of Psychiatry*,*13*(4), 273-281.

Kanchanatawan, B., Thika, S., Anderson, G., Galecki, P., & Maes, M. (2018). Affective symptoms in schizophrenia are strongly associated with neurocognitive deficits indicating disorders in executive functions, visual memory, attention and social cognition. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, *80*, 168-176.

Kay, S. R., Fiszbein, A., & Opler, L. A. (2012). Positive and negative syndrome scale (PANSS). MHS.

Koola, M. M. (2018). Potential role of antipsychotic-galantamine-memantine combination in the treatment of positive, cognitive, and negative symptoms of schizophrenia. *Complex Psychiatry*, *4*(3), 134-148.

Kostakoğlu AE, Batur S, Tiryaki A. (1999). Pozitif ve negatif sendrom ölçeğinin (PANSS) Türkçe uyarlamasının geçerlik ve güvenirliği. *Türk Psikoloji Dergisi, 14*, 23-32.

Larsson-Lund, M., & Nyman, A. (2017). Participation and occupation in occupational therapy models of practice: A discussion of possibilities and challenges. *Scandinavian journal of occupational therapy*, *24*(6), 393-397.

Lewis, C.B.& Bottomley, J. M. (1994). *Geriatric physical therapy: A clinical approach*. Norwalk: Appleton and Lange.

Mason, O. J., & Brady, F. (2009). The psychotomimetic effects of short-term sensory deprivation. *The Journal of nervous and mental disease*, *197*(10), 783-785.

McCutcheon, R. A., Marques, T. R., & Howes, O. D. (2020). Schizophrenia—an overview. *JAMA psychiatry*, *77*(2), 201-210.

Meredith, P., Moyle, R., & Kerley, L. (2020). Substance use: links with sensory sensitivity, attachment insecurity, and distress in young

adults. *Substance Use & Misuse*, *55*(11), 1817-1824.

O'Brien, J., & Kuhaneck, H. (2019). Using occupational therapy models and frames of reference with children and youth. *Case-Smith's Occupational Therapy for Children and Adolescents-E-Book*, 18.

Öztürk, M. O., & Uluşahin, A. (2014). *Ruh sağlığı ve bozuklukları*. Nobel Tıp Kitabevleri.

Pettersson-Yeo, W., Allen, P., Benetti, S., McGuire, P., & Mechelli, A. (2011). Dysconnectivity in schizophrenia: where are we now?. *Neuroscience & Biobehavioral Reviews*, *35*(5), 1110-1124.

Rabinowitz, J., Levine, S. Z., Garibaldi, G., Bugarski-Kirola, D., Berardo, C. G., & Kapur, S. (2012). Negative symptoms have greater impact on functioning than positive symptoms in schizophrenia: analysis of CATIE data. *Schizophrenia research*, *137*(1-3), 147-150.

Ratelle, C. F., Vallerand, R. J., Chantal, Y., & Provencher, P. (2004). Cognitive adaptation and mental health: A motivational analysis. *European Journal of Social Psychology*, *34*(4), 459-476.

Rieke, E. F., & Anderson, D. (2009). Adolescent/Adult Sensory Profile and obsessive–compulsive disorder. *The American Journal of Occupational Therapy*, *63*(2), 138-145.

Samsonraj, R. S., Loughran, M. F., & Secker, J. (2012). Evaluating outcomes of therapies offered by occupational therapists in adult mental health. *Journal of Mental Health*, *21*(6), 531-538.

Scheewe, T. W., Backx, F. J. G., Takken, T., Jörg, F., Van Strater, A. C. P., Kroes, A. 1., ... & Cahn, W. (2013). Exercise therapy improves mental and physical health in schizophrenia: a randomised controlled trial. *Acta Psychiatrica Scandinavica*, *127*(6), 464-473.

Sherwood, W. (2011). An introduction to the Vona du Toit model of creative ability. *Revista electrónica de terapia ocupacional Galicia, TOG*, (14), 12.

Shiraishi, N., & Reilly, J. (2019). Positive and negative impacts of schizophrenia on family caregivers: a systematic review and qualitative meta-summary. *Social psychiatry and psychiatric epidemiology*, *54*(3), 277-290.

Silaule, O. (2017). Routine measurement of outcomes for mental health care users attending occupational therapy in an acute mental health care unit within a rural context. *Faculty of Health Sciences, School of Therapeutic Sciences. University of the Witwatersrand. Johannesburg*.

Simeone, J. C., Ward, A. J., Rotella, P., Collins, J., & Windisch, R. (2015). An evaluation of variation in published estimates of schizophrenia prevalence from 1990─ 2013: a systematic literature review. *BMC psychiatry*, *15*(1), 1-14.

Tripathi, A., Kar, S. K., & Shukla, R. (2018). Cognitive deficits in schizophrenia: understanding the biological correlates and remediation strategies. *Clinical Psychopharmacology and Neuroscience*, *16*(1), 7.

Utz, F., Böge, K., Hahn, E., Fuchs, L., Schomerus, G., Angermeyer, M., & von Lersner, U. (2019). Public attitudes towards depression and schizophrenia in an urban Turkish sample. *Asian Journal of Psychiatry*, *45*, 1-6.

Van der Reyden, D., Casteleijn, D., Sherwood, W., & De Witt, P. (2019). *The Vona du Toit Model of Creative Ability: Origins, Constructs, Principles and Application in Occupational Therapy*. Vona and Marie du Toit Foundation.

Zengin, G., & Huri, M. (2022). The sensory processing patterns of individuals with schizophrenia with comorbid substance use disorder. *Journal of Substance Use*, 1-9.

How to cite this article: Zengin, G., Yazici, M.R. and Huri, M. (2022). Sensory Integration Based Program Developed According to the Model of Creative Ability in an Individual with Schizophrenia: An Occupational Therapy Case Report. *Int J Disabil Sports Health Sci*; 5(1):66-74.https://doi.org/10.33438/ijdshs.1099222.

THANKS TO THE COMMITTEE OF REFEREES

Acknowledgments to the Board of Referees We would like to thank all of our colleagues for their valuable contributions by taking the time to evaluate the articles in the "International Journal of Disabilities Sports and Health Sciences (IJDSHS)" 2022 volume: 5 issue: 1.

Prof.Dr. Zeliha BAŞKURT

Prof. Dr. Neslihan ALKAN DURUTÜRK

Prof. Dr. Zeliha YÜRÜK

Doç.Dr. Sibel NALBANT

Doç.Dr. Nursen ÖZDEMİR İLÇİN

Doç. Dr. Ayla GÜNAL

Doç.Dr. Emel BAHADIR YILMAZ

Doç.Dr. Emrah BİLGENER

Doç.Dr. Kadir YILDIZ

Doç.Dr. Nihan ÖZÜNLÜ PEKYAVAŞ

Dr. Öğr. Üyesi Umut Ziya KOÇAK

Dr. Öğr. Üyesi Emre Serdar ATALAY

Dr. Öğr. Üyesi Sebahat Yaprak ÇETİN

Dr. Öğr. Üyesi Nuray ELİBOL

Dr. Öğr. Üyesi Nursemin ÜNAL

Dr. Melike Gizem KALAYCI

Dr. Gözde ÖNAL

Dr. Rukiye Begüm KOCA