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RESEARCH ARTICLE

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

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

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

INTRODUCTION

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

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

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

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

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

MATERIALS AND METHODS

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

Participants

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

Inclusion Criteria

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

Exclusion Criteria

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

Procedure

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

Outcome Measurement

PedsQL

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

PAQ-C

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

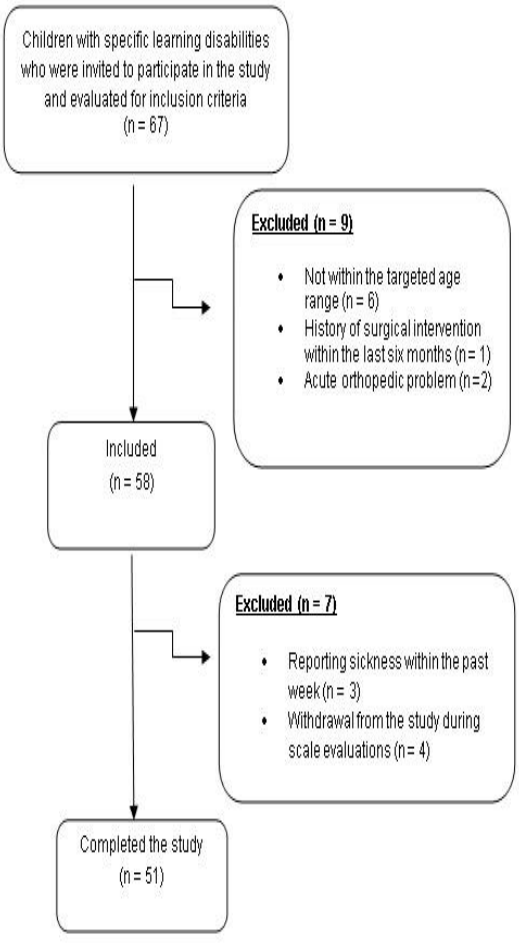

Figure 1. Flow Chart of the Study

Statistical Analysis

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

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

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

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

RESULTS

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

Table 1. Descriptive data of the participants

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

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

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

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

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

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

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

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

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

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

DISCUSSION

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

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

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

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

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

Conclusion

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

Acknowledgement

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Conflict of Interest

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

Ethics Committee

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

Author Contributions

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

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