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Investigation of the Relationship Between Digital Addiction and Physical Activity Levels in Children and Adolescents*

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Abstract

The aim of this study is to investigate the relationship between digital addiction (DA) and physical activity (PA) levels in children and adolescents. The sample of this cross-sectional and descriptive study consists of 400 students, 267 girls, aged 8-17, in Izmir. The participants were administered the handgrip strength test, the PA Level Scale (QPAC-C), and the DA Level Scale, which have been validated and reliable in Turkish for children and adolescents. DA (55.7±15.8, M:3.52±0.62; F:3.40±0.56, p=0.200) and PA (3.44±0.58) and handgrip strength (23.9±9.82kg, M:25.3±13.2kg, F:23.2±7.58kg, p=0.525) were compared according to gender, and the results for men were higher than for women. The difference in PA level (M:3.52±0.62, F:3.40±0.56, p=0.020) between the genders was significant (Mann-Whitney U). DA and PA levels (p=0.325) and handgrip strength results were compared between ages (Kruskal Wallis), and it was found that handgrip strength and DA levels were significantly different between ages (One-Way ANOVA). There was a significant difference in hand grip strength between all ages except 9-10, 11-12, 14-15, 14-16, and 16-17 years old (Mann-Whitney U), and in DA between 8 and 11, 13, 15 and 16 years old (Bonferroni post hoc). A positive correlation was found between age and DA (r=0.252, p<0.001) and handgrip strength (r=0.822, p<0.001) (Spearman's Rank Coefficient). Society needs to be made aware of the need to reduce the DA level that increases with age and to create conditions that will increase the PA level. In future studies, it is recommended that biological, psychological, and socio-cultural factors be evaluated to determine age and gender differences.

Keywords: Child, Exercise, Screen addiction, Physical inactivity, Youth

* This article is produced from the master's thesis of the first author.

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INTRODUCTION

Digital addiction (DA) can be defined as an addiction to spending more time than necessary on activities such as the internet, social media, online chat, and computer games, especially for entertainment purposes, through a technological device (Aziz et al., 2021). Digital addiction is a behavioral technology addiction fueled by a sense of incompleteness. The term digital addict is used to describe an individual who is so interested in technology that it has a negative effect on the public and an effect that creates continual action on the user (Rugai & Hamiliton-Ekeke, 2016).

On the other hand, the internet is a communication network where individuals can access the content they desire regardless of time and place (Langley & Hutt, 2022). In fact, children's balanced and appropriate use of communication networks such as the internet can be significantly effective in increasing their academic success and developing social competence and cognitive skills (Dresp-Langley, 2020). However, excessive computer and internet use can lead to social, mental, and physical problems (Sasmaz et al., 2014). Research suggests that excessive use of digital devices can adversely impact biological, psychological, and social development. This is particularly true for individuals at developmental ages, where unconscious and excessive technology use can lead to issues such as attention deficit, hyperactivity, and impulse control. (Yılmaz & Özkan, 2024). Young individuals are the most active users of mobile technologies. Frequently used smartphones can create habits, increase the likelihood of developing addictive behaviour, and lead to unwanted behaviours triggered by internal and external stimuli (Deursen et al., 2015). The age range is wide in digital addiction, where adolescent and adult groups experience related problems (Kuss et al., 2014). Physical activity (PA) and sports participation can prevent smartphone addiction in children and adolescents (Azam et al., 2020).

Physical activity is defined as activities that occur in life by using muscles and joints to expend energy, increase heart and respiratory rates, and result in different levels of fatigue depending on the type of PA. PA is very important for a healthy development process, participation in social life, and quality of life in children and adolescents (Baltacı, 2012). Physical activity offers numerous benefits for the physical and mental health of children and adolescents. From a psychological viewpoint, physical activity boosts children's self-confidence, enhances their self-esteem, and has a positive impact on their academic performance. It also contributes to their emotional well-being by alleviating symptoms of depression (Meydanlıoğlu, 2015). In contrast, excessive use of video games, television, or internet activities within digital activities leads to an increase in sedentary behaviors (Pop, 2015). Since children's physical development processes continue until adulthood, excessive use of smartphones, which are communication tools, during childhood and adolescence does not have a positive effect on children's physical development (Park & Park, 2014). Decreased physical activity during adolescence can lead to negative effects such as metabolic disorders, hormone imbalances, psychological and social difficulties, and growth and development problems (Eisenmann & Wickel, 2009). Increasing physical activity plays a vital role in the prevention and treatment of obesity (Eliacik et al., 2016). It helps strengthen muscles and bones while reducing

the risk of cardiovascular diseases, high blood pressure, Type II diabetes, and some types of cancer (Meydanlıoğlu, 2015).

The handgrip strength test is an effective tool for identifying potential problems that arise during children's developmental processes, in addition to its main purpose. Low handgrip strength, muscle weakness, or physical activity deficiencies can be determined at early stages. This supports the reduction of health-related risks with special exercise programs and interventions planned in accordance with the needs of children (Cohen et al., 2016). Physical activity has an important effect on increasing handgrip strength, which is one of the basic elements of physical fitness for children and adolescents. It has been shown that an increase in handgrip strength is observed in children who exercise regularly and that this increase is closely related to the development of muscle mass (Graves et al., 2010; Meşe-Yavuz & Başyiğit, 2023).

For these reasons, schools can play an important role by identifying children with low physical fitness and encouraging positive health behaviors such as being active, especially by emphasizing the intensity of activity. Childhood and adolescence are very important periods of life due to the dramatic physiological and psychological changes that occur. To help children in schools increase their PA levels, it will be important to increase societies' knowledge levels and conduct successful studies worldwide (Guthold et al., 2010).

Previous studies have shown that digital addiction has negative effects on children and adolescents. In this study, the relationship between DA and PA levels of children and adolescents between the ages of 8 and 17 will be investigated. The study hypotheses are that DA levels and hand grip strength will increase, while PA levels will decrease with children's age; PA levels and hand grip strength will differ between genders in children and adolescents; DA levels will not differ between genders; and children and adolescents with high DA levels will exhibit low PA levels and hand grip strength.

METHOD

Design and Participants

The study has a cross-sectional descriptive feature in a mixed-pattern relational model that includes quantitative and qualitative measurements. The sample of the research is a total of 400 participants, including 220 students registered and attending İzmir Bahçeşehir College Güzelbahçe Campus in the 2023-2024 academic year and 180 children in sports clubs doing infrastructure training in the İzmir province.

Data Collection and Tools

Participant Information Form: The researcher prepared an open-ended form. It consisted of questions regarding the participants' age, gender, height, mass, current grade, dominant hand,

possession of a mobile phone/tablet/laptop, and the duration of use of these devices during the day. It did not include any questions regarding the participants' identity information.

Physical Activity Level Scale: The Physical Activity Scale was validated and reliably studied by Erdim et al. (2019) for the age group 8-14, and Cronbach's $\alpha = 0.77$ was reported for the general sample and had an acceptable level of internal consistency. The scale consists of 10 questions.
The validity and reliability of the Physical Activity Scale for the 14-18 age groups was evaluated by Polat (2017). Test-retest studies were determined with the ICC coefficient (0.878), and it was shown that the ICC coefficient varied between 0.713 and 0.995. In addition, the Cronbach alpha value was found to be between 0.90 and 0.85, which shows that the scale has a high internal consistency. Both scales consist of 10 questions. It is measured with a 1–5-point scale out of 9 questions that evaluate the level of physical activity; low scores indicate low activity, and high scores indicate high activity. The first and ninth questions are evaluated by dividing them between 14 and 7, respectively, while the other questions cover activities performed at certain times of the day. The average of the scores of all questions determines the child's total physical activity level; "1" means low, and "5" means high physical activity (Aygün-Polat, 2017; Erdim et al., 2019).

Digital Addiction Scale: The reliability of the Digital Addiction Scale, whose validity and reliability were conducted by Kaçmaz et al. (2023), was evaluated with the Cronbach Alpha coefficient and was recorded as 0.84 for interpersonal relationships, 0.85 for introverted factors, and 0.90 for the general scale. This scale consists of 25 items and 2 sub-dimensions. These sub-dimensions are interpersonal relationships (items 4, 6, 9, 10, 13, 16, 17, 18, 19, 20, 22, 23, and 25), introverted factors (items 1, 2, 3, 5, 7, 8, 11, 12, 14, 15, 21 and 24). There are no reverse-scored items. The total score that can be obtained from the scale varies between 25 and 125, with higher scores indicating a greater risk of digital addiction.

Handgrip Strength Test: Handgrip strength is necessary for many functional activities in daily life (Lee & Gong, 2020). It is recommended that handgrip strength be included in comprehensive health assessments for children and adolescents in school and clinical settings (Matsudo et al., 2014). This test is a method frequently used in epidemiological studies of muscle strength, endurance, and flexibility (Ortega et al., 2008). Measuring muscle strength with a hand-held dynamometer is an effective, low-cost, and practical method for clinically assessing the health status of individuals (Amaral et al., 2015) and is one of the most used tests to assess muscle fitness in epidemiological studies.

The optimum grip aperture is affected by hand size in both genders, which indicates that the grip aperture of the dynamometer should be adjusted according to the individual's hand size. A Takai brand (Tokyo, Japan) Hand Dynamometer was used to measure hand grip strength. This dynamometer has been shown to have the highest standards of validity and reliability in measuring maximum hand grip strength for the young group (España-Romero et al., 2010).

To determine the dominant hand, participants were asked which hand they used while writing. Before measuring grip strength, the dynamometer was adjusted according to the participant's hand size. Handspan was determined by measuring the farthest distance between the thumb and the tip of the little finger on the dominant hand (Noonari et al., 2019). The measurement was performed in a sitting position, with the humerus positioned at the side of the body and the elbow flexed at 90 degrees. In each trial, participants were instructed to squeeze the dynamometer with maximum effort for two to three seconds (Steffl et al., 2017). Grip strength measurements for the dominant hands of the participants were taken at least twice, and the highest value was recorded in kilograms (Sartorio et al., 2002).

Ethical Approval

Permission was obtained from the İzmir Governorship Provincial Directorate of National Education for the conduct of the study. The research was deemed appropriate by the Ege University Medical Faculty Medical Research Ethics Committee (28/12/2023; Number: 21-1.1T/58) to follow the 'Ethical Principles in Medical Research Conducted on Human Subjects. Each athlete was informed about the study order and possible risks, and written-signed consents of the athletes and their parents were obtained through the "Informed Consent Form."

Analysis of Data

Statistical analyses of the data were evaluated using the SPSS (version 25.0, SPSS Inc, Chicago, IL, USA) statistical program. Descriptive data of the total, gender, and age-based digital addiction scale, physical activity scale, and hand grip strength test results of all participants were expressed as mean, standard deviation, and minimum and maximum values. The compliance of the data with normal distribution was determined with the Kolmogorov-Smirnov test. According to this result, the difference between the scale and test results between genders was analyzed with the Mann-Whitney U test or the Independent Sample t-test. Kruskal Wallis-H and Mann-Whitney U test, or one-way analysis of variance, and Dunn Bonferroni (post hoc) tests were used to determine the difference between the scale and test results according to age. The effect size of the differences was reported according to partial eta squared (ηp^2) values. The level of relationship between the data was analyzed using Spearman's rank correlation coefficient test. The value of $p \leq 0.05$ was taken as the basis for significance.

The sample size was calculated with G-power (version 3.1.9.7, Franz Faul, Universitat Kiel, Dusseldorf, Germany). In the power analysis, a sample size of at least 366 was determined to determine a small effect size ($p = 0.17$) with $\alpha = 0.05$ and a 1-β margin of error of 0.95 for relational measures.

RESULTS

Table 1 shows the age, PA level, DA level scale scores, and hand grip strength results of 400 students between the ages of 8 and 17 who voluntarily participated in the study.

Table 1. Descriptive data of the participants

Variables	Min.	Max.	Mean	Std. Dev.
Age (year)	8.0	17.0	11.9	2.53
Physical activity level (score)	1.44	4.89	3.44	0.58
Digital addiction level (score)	25.0	110	55.7	15.8
Handgrip test result (kg)	6.50	63.3	23.9	9.82

The frequency distribution of the participants according to their age and gender is given in Table 2. Accordingly, it was understood that the highest number of participants were aged 10 (n=63, 15.8%) and 11 (n=62, 15.5%); there were more females (n=267, 66.8%) than males (n=133, 33.3%).

Table 2. Frequency distribution of participants according to age and gender

Age	Frequency (n)	Rate (%)
8.00	43	10.8
9.00	27	6.75
10.0	63	15.8
11.0	62	15.5
12.0	56	14.0
13.0	40	0.10
14.0	27	6.75
15.0	35	8.75
16.0	37	9.25
17.0	10	2.50
Total	400	100
Gender	**Frequency (n)**	**Rate (%)**
Female	267	66.8
Male	133	33.3
Total	400	100

The data in the research were analyzed for compliance with normal distribution using the Kolmogorov-Smirnov test. Accordingly, physical activity level scores ($p=0.003$) and hand grip strength results ($p<0.000$) are not normally distributed, whereas digital addiction level scores ($p=0.200$) show a normal distribution.

Table 3 shows the distribution of participants' PA and DA levels and hand grip strengths by gender. Accordingly, men's results are higher than women's in all measurement parameters.

Table 3. Distribution of participants' physical activity, digital addiction levels, and hand grip strengths between genders

Female (n=267)	**Min.**	**Max.**	**Mean**	**Std. Dev.**
Physical activity level (score)	1.44	4.78	3.40	0.56
Digital addiction level (score)	7.80	46.5	23.2	7.58
Handgrip test result (kg)	25.0	107	55.0	15.0
Male (n=133)				
Physical activity level (score)	1.89	4.89	3.52	0.62
Digital addiction level (score)	6.50	63.3	25.3	13.2
Handgrip test result (kg)	25.0	110	57.1	17.2

Physical activity level and handgrip strength results were compared between genders, and PA level scores were significantly different between genders (p =0.020) (Table 4).

Table 4. Comparison of physical activity level and handgrip strength results between genders (Mann-Whitney U test)

	Physical activity level (score)	**Handgrip test result (kg)**
Mann-Whitney U	15225.5	17062.5
Wilcoxon W	51003.5	25973.5
Z	-2.327	-.636
p-value	**.020**	.525

Digital addiction level scores were compared between genders, and no significant difference was found (p =0.200) (Table 5).

Table 5. Comparison of digital addiction level scores between genders (Independent Sample T Test)

DA level score	t	df	p-value	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Equal variances assumed	-1.283	398	.200	-2.1464	1.673	-5.44	1.142

When the participants' physical activity scores were evaluated according to age, it was determined that the highest physical activity score was in the 17 to 8 age group (Table 6).

Table 6. Distribution of participants' physical activity scores according to age

Age	N	Mean	Std. Dev.	Min.	Max.
8.00	43	**3.52**	0.68	1.89	4.89
9.00	27	3.29	0.56	1.44	4.56
10.0	63	3.44	0.59	2.22	4.56
11.0	62	3.48	0.49	2.44	4.44
12.0	56	3.39	0.63	1.89	4.67
13.0	40	3.40	0.57	2.22	4.78
14.0	27	3.44	0.59	2.00	4.33
15.0	35	3.42	0.55	2.00	4.33
16.0	37	3.37	0.60	2.00	4.44
17.0	10	**3.91**	0.49	3.11	4.78

When the participants' handgrip strengths were evaluated according to age, the highest handgrip strength was found in the 17—and 16-year-old age groups (Table 7).

Table 7. Distribution of participants' hand grip strengths according to age

Age	N	Mean	Std. Dev.	Min.	Max.
8.00	43	12.62	3.00	6.50	23.2
9.00	27	16.54	2.98	11.3	22.1
10.0	63	17.94	3.38	11.8	25.3
11.0	62	21.19	4.94	10.9	40.0
12.0	56	22.09	4.30	13.3	31.9
13.0	40	27.58	6.09	14.4	46.5
14.0	27	33.16	8.82	15.5	49.2
15.0	35	31.28	8.22	13.9	52.9
16.0	37	37.08	9.07	23.0	59.4
17.0	10	44.75	13.0	29.7	63.3

Participants' physical activity level and handgrip strength results were compared between ages, and it was found that handgrip strength was significantly different between ages ($p < 0.001$) (Table 8).

Table 8. Comparison of participants' physical activity level and handgrip strength results between ages (Kruskal Wallis Test)

	Physical activity level (score)	Handgrip test result (kg)
Kruskal-Wallis H	10.317	274.943
df	9	9
p-value	.325	**<0.001**

The Mann-Whitney U test was applied to determine which ages caused the significant difference in hand grip strength, and a significant difference was found between all ages except for the

comparisons between the ages of 9-10, 11-12, 14-15, 14-16 and 16-17 ($p<0.05$). The distribution of participants' digital addiction level scores between ages is shown in Table 9.

Table 9. The distribution of the participants' digital addiction level scores between ages

	N	Mean	Std. Dev.	Min.	Max.
8.00	43	46.56	15.7	25.0	89.0
9.00	27	50.96	14.5	31.0	101
10.0	63	53.03	15.0	25.0	96.0
11.0	62	57.81	16.5	26.0	107
12.0	56	55.55	13.5	29.0	89.0
13.0	40	58.68	15.9	28.0	95.0
14.0	27	58.93	12.4	25.0	77.0
15.0	35	**60.77**	13.2	35.0	91.0
16.0	37	58.08	19.1	27.0	110
17.0	10	**63.80**	16.7	48.0	98.0

One-way Variance Analysis was used to compare the digital addiction levels of the participants according to their ages, and a significant difference was found ($p= 0.001$) (Table 10).

Table 10. Comparison of the digital addiction levels of the participants according to their ages

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7138.57	9	793.174	3.357	**0.001**
Within Groups	92134.54	390	236.242		
Total	99273.11	399			

The Bonferroni post hoc test was applied to determine which ages caused the significant difference in digital addiction levels. A significant difference was found between the ages of 8 and 11 ($p= 0.015$), 13 ($p= 0.017$), 15 ($p= 0.003$), and 16 ($p= 0.041$).

The level of relationship between the measured data of the participants was analyzed with Spearman's Rank Coefficient Test, and a positive correlation was found between age and digital addiction level ($r= 0.252$, $p <0.001$) and hand grip strength ($r= 0.822$, $p <0.001$).

DISCUSSION

In this study, which aimed to investigate the relationship between digital addiction and physical activity levels in children and adolescents, the hypothesis that as children age, DA levels and hand grip strength increase while PA level decreases was confirmed. Additionally, the hypothesis that PA level and hand grip strength would differ between genders in children and adolescents was also confirmed, as was the hypothesis that DA level would not differ between genders. However, the hypothesis that children and adolescents with high DA levels would have low PA levels and hand grip strength could not be confirmed.

Some cross-sectional studies have predicted that higher PA levels may reduce the rates of DA among adolescents and young adults, suggesting a negative correlation between PA and DA (Kim et al., 2015; Li et al., 2021; Zhong et al., 2020; Yang et al., 2019). In contrast, physical inactivity has been shown to increase the risk of DA due to long-term use of mobile phones, and there is evidence that sedentary behaviors and low PA levels are strong predictors of time spent using smartphones in adolescents and adults (Barkley & Lepp, 2016; Fennell et al., 2019; Haug et al., 2015; Xiang et al., 2020). In addition, the findings obtained in the studies generally show that as age increases, DA levels and hand grip strength increase, whereas PA levels decrease, and PA levels and hand grip strength are higher in boys than in girls. Unlike our findings, it was found that the DA level was higher in boys than in girls and that children and adolescents with higher DA levels had lower PA levels and hand grip strength. For example, a high level of negative correlation was found between the total scores of digital game addiction and PA levels of a total of 330 participants ($r = -0.35$, $p < 0.01$). It was observed that the total mean score of male students for digital game addiction was higher than that of female students, and this difference was statistically significant. Students with higher PA levels had significantly lower levels of digital game addiction (Hazar et al., 2017).

In one study, it was found that obese children and adolescents had higher internet addiction scores than non-obese ones. The average internet addiction scores of boys were found to be higher than those of girls. No difference was found in internet addiction scores in the three subgroups examined: 8-12 years old, 12-15 years old, and 15-18 years old (Koca et al., 2023). In middle school students aged 11-14, it was found that male students were exposed to digital screens for longer periods than female students in terms of PA levels. As a result of the study, the average daily screen use of students was found to be two hours. In studies conducted in this context in the literature, it was found that students were exposed to screens for longer periods (Güneş et al., 2023).

In a study on the effects of smartphone addiction on physical activity in secondary school children, PA levels were found to be significantly lower in female participants aged 12-14 with high internet and phone use. In male participants with normal internet and phone use, it was found that they showed significantly higher results in physical performance measurements, including left and right-hand grip strength and vertical jump height. As a result of this study, it was determined that children without smartphone addiction had significantly more PA compared to those who were addicted (Al-Amri et al., 2023).

In a study investigating the psychological state of problematic internet use in adolescents, their compliance with the Mediterranean diet, and the physical activity level of a total of 791 students between the ages of 12 and 16, it was reported that problematic mobile phone and internet use negatively affected this age group physically and psychologically. It was shown that problematic internet use was more intense with low PA, especially in girls, while problematic internet and mobile phone use did not negatively affect hand grip strength and vertical jump results in boys (Mateo-Orcajada et al., 2023). In a study conducted with parents of children aged 6-12 years and

investigating the effect of children's technology use on PA levels, it was found that excessive use of technological devices was significantly associated with low PA levels. It was also suggested that children who used devices for less than five hours a week tended to reach higher PA levels than those who used devices for more than six hours a week (Alotaibi et al., 2020).

The relationship between exercise, PA, and internet use was investigated in students aged 13-15, and it was revealed that students who continued to exercise spent less time using the internet. This finding was supported by the fact that PA could be a helpful factor in reducing online time in students in this age group (Lapousis, 2016). In a study addressing the harms of media and technology using the categories of children (4-8 years old), pre-adolescents (9-12 years old), and adolescents (13-18 years old), it was stated that children, pre-adolescents, and adolescents who had more screen time tended to participate in lower PA. When pre-adolescents and adolescents were examined, increased daily media and technology use had a negative impact on physical health status and was associated with a weakening tendency to engage in PA (Rosen et al., 2014).

In a study examining sedentary behaviors, it was observed that boys aged 3-11 used electronic games and computers more than girls of the same age, but total screen time use was similar in boys and girls. It was stated that PA decreased as the time spent in front of the screen increased. Especially in adolescents (12-18 years), more screen time use was associated with decreased PA time (Biddle et al., 2010). At the same time, studies in Turkey revealed that internet use was more common among boys (Sasmaz et al., 2014). In the study examining the relationship between internet addiction, mental health, and PA among 459 female students with an average age of 12, it was found that internet addiction had a significant inverse relationship with PA. In general, the PA level of the participating girls in this study was found to be low. In addition, it was found that girls who spent more time online had lower PA levels (Baniasadi et al., 2022).

In our study, the fact that the PA levels and hand grip strengths of children and adolescents with high DA levels were not lower and that the DA levels did not differ between genders, may be attributed to the sample group consisting of students from private schools with substantial financial resources and children and adolescents who attended sports clubs. Although not explored in this study, the combination of a balanced diet, regular physical activity, and a lifestyle that moderates digital device usage —encouraged by educated and mindful parents— may help clarify the results obtained. The intentional choices of such parents to enhance the overall health and fitness of their children could be linked to the positive outcomes observed in the study. The only study that yielded results similar to this research but differed from others was the one that found that adolescents' risky behaviors related to internet use did not significantly affect physical activity levels. (Chacón-Borrego et al., 2018).

In addition, studies have shown that excessive internet and computer use is associated with a higher body mass index, even in individuals with high PA levels. This finding suggests that reducing the time spent on sedentary behaviors such as computer and internet use in leisure time, as well as nutrition and PA strategies, may be important for reducing excess weight and obesity rates

(Vandelanotte et al., 2009). Children who adopt a sedentary lifestyle (internet use, watching television, playing computer games) may have an unhealthy life and chronic diseases compared to children who adopt an active lifestyle both during childhood and adolescence (Hills et al., 2007). Excessive use of digital devices such as smartphones and portable games by children and adolescents may negatively affect fine motor skills, manual dexterity, grip strength, and other manual skills. At the same time, digital addiction can lead to thumb and forearm pain and visual impairments (El-Sharkawy et al., 2024). Since significant developmental differences occur during adolescence, which is the most vulnerable age group for internet addiction, internet use may appeal to individuals during this period, and this may cause them to experience social and physical problems. The development of risky behaviors (substance and tobacco use), poor sleep habits, and physical inactivity have been observed in adolescents who use the internet excessively (Durkee et al., 2016). Adolescents who spend too much time watching television, using computers, and playing video games may be associated with being overweight, having decreased PA, and energy expenditure (Melchior et al., 2014). PA levels can be increased through an automatic and internet-based behavioral change system. These aspects of internet use should be explored and implemented in terms of physical health benefits (Hurling et al., 2007).

Some limitations should be noted in the evaluation of this study. First, the study results can only be attributed to the young population between the ages of 8 and 17. Second, the composition of the study group, which included private school students and active participants in various sports clubs, may have influenced the findings regarding the unmet hypothesis of a negative correlation between physical activity levels and digital addiction.

CONCLUSIONS

When the participants' DA and PA levels and handgrip strengths were compared according to gender, it was found that the results for men were higher than those for women. The difference in PA level scores between genders was significant. When evaluated according to age, it was found that the highest PA score of the participants was in the 8 to 17 age group, the highest hand grip strength was in the 16 to 17 age group, and the highest DA score was in the 15 to 17 age group. The participants' DA level, PA level, and handgrip strength results were compared between ages, and it was found that handgrip strength ($p<0.001$) and DA levels ($p=0.001$) were significantly different between ages. A significant difference was found in hand grip strength between all ages except for the ages of 9-10, 11-12, 14-15, 14-16, and 16-17. A significant difference was found in DA levels between the ages of 8 and 11, 13, 15, and 16. A positive significant correlation was found between age, DA level, and handgrip strength.

In future studies on this subject, data collection tools that address the differences between male and female participants regarding biological, psychological, and socio-cultural factors can be utilized when examining gender differences. More research should be conducted to understand the reasons for the observed differences, particularly among certain age groups. Additionally, future

studies could explore the impact of families on digital device usage and how they influence children's daily habits, which would significantly contribute to the field. Based on the study's results, educational programs and interventions aimed at balancing technology use may be designed, along with awareness-raising strategies at both individual and societal levels.

Data Availability: The data sets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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