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Physical Activity Levels of Turkish Individuals with Special Educational Needs and Its Predictors

Özel Eğitim İhtiyacı Olan Türk Bireylerin Fiziksel Aktivite Düzeyleri ve Bunun Yordayıcıları

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ABSTRACT Objective: It is known that physical activity levels of disabled individuals are lower than those of healthy individuals, both among adolescence and adulthood. This study aims to compare the physical activity levels of individuals with disabilities from various diagnosis groups and try to define the predictors of physical activity levels of individuals with disabilities. **Material and Methods:** A total of 275 participants (103 women and 172 men) with either one of the following disabilities (or their representatives) filled in the International Physical Activity Questionnaire-Short Form and a Participant Information Form: intellectual disabilities, hearing impairment, language-speech disorders, specific developmental disorder and pervasive developmental disorder. **Results:** Fifteen per cent of the participants were highly active (n=42), 20% were moderately active (n=54) and 65% were low level active (n=179). Total physical activity, high-intensity physical activity, walking amounts and daily average sitting time of the participants differed significantly between the diagnostic groups. ($p<0.001$, $p=0.037$, $p=0.002$ and $p=0.001$, respectively). People with hearing impairment were the most active and people with severe intellectual disability were the least active. Sex, diagnosis and the father's having postgraduate training were significant predictors of physical activity levels. **Conclusion:** Majority of the individuals with disabilities do not meet the minimum physical activity recommendations. Physical activity levels differ among various diagnoses groups and people with severe intellectual disability require the most attention.

Keywords: Exercise; developmental disabilities; intellectual disability; learning disorders; hearing loss; language development disorders

ÖZET Amaç: Engelli bireylerin fiziksel aktivite düzeylerinin hem ergenlik hem de yetişkinlik döneminde sağlıklı bireylerden daha düşük olduğu bilinmektedir. Bu çalışmanın amacı, farklı tanı gruplarından engelli bireylerin fiziksel aktivite düzeylerini karşılaştırmak ve engelli bireylerin fiziksel aktivite düzeylerinin bazı yordayıcılarını saptamaktır. **Gereç ve Yöntemler:** Uluslararası Fiziksel Aktivite Anketi - Kısa Form ve Katılımcı Bilgi Formu, şu tanılardan birine sahip toplam 275 katılımcı (103 kadın ve 172 erkek), ya da vasisi tarafından doldurulmuştur: Zeka Geriliği, işitme kaybı, konuşma ve dil özel gelişimsel bozukluğu, skolastik becerilerde özel gelişim bozukluklar ve yaygın gelişimsel bozukluklar. **Bulgular:** Katılımcıların %15'inin fiziksel aktivite düzeyi yüksek (n=42), %20'sinin orta (n=54) ve % 65'inin düşük (n=179) olarak tespit edilmiştir. Toplam fiziksel aktivite, şiddetli fiziksel aktivite, yürüme miktarları ve katılımcıların günlük ortalama oturma süresi; tanı grupları arasında anlamlı farklılık göstermiştir (sırasıyla, $p<0,001$, $p=0,037$, $p=0,002$ ve $p=0,001$). İşitme kaybı olan kişilerin fiziksel aktivitye düzeyi en yüksek iken, ağır zeka geriliği olan kişiler en az aktif olarak saptanmıştır. Cinsiyet, tanı ve babanın lisansüstü eğitim almış olması, katılımcıların fiziksel aktivitesinin anlamlı yordayıcılarıdır. **Sonuç:** Engelli bireylerin çoğunluğu asgari fiziksel aktivite önerilerini karşılamamaktadır. Fiziksel aktivite seviyeleri çeşitli teşhis grupları arasında farklılık gösterir ve ağır zeka geriliği olan kişiler bu hususta en fazla dikkati gerektirir.

Anahtar Kelimeler: Egzersiz; gelişim yetersizlikleri; entellektüel engellilik; öğrenme bozukluğu; işitme kaybı; dil yeteneğinde gelişim kusurları

Adequate and regular physical activity is an effective method for protecting and improving the health of all individuals. However, more than 80% of the world's adult population falls below the recommended level of movement.[1] The World Health Organization does not provide separate physical activity goals for people with disabilities. WHO recommends for individuals aged between 18-65 to perform moderate aerobic exercise for at least 150 minutes per week, and to do strength exercises involving large

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muscle groups for 2-3 days per week. These recommendations are also valid for people with disabilities, provided that necessary adjustments are made.[1] Similarly, children between the ages of 5-17 are recommended to do moderate aerobic exercise for at least 1 hour per day, and also do exercises that stimulate muscle and bone development 2-3 days a week. This recommendation applies to children with disabilities as well[1]. Similarly, The American College of Sports Medicine suggests that the general principles of exercise programming for healthy individuals apply to programs for persons with intellectual disabilities[2]. These recommendations emphasize that the aerobic exercise training recommendations should aim at achieving an energy expenditure of ≥2,000 kcal/week, but individuals who cannot meet these recommendations should be as active as their abilities allow. Exercise prescription of individuals with disabilities should target improving not only aerobic and muscular fitness but also balance[3]. Besides the patients with intellectual disabilities, individuals with autism spectrum disorder are also recommended to engage in moderate to vigorous aerobic exercise 3 to 5 days a week and resistance exercise 1 to 2 days a week[4].

Individuals with disabilities benefit from physical activity in many respects. Regular physical activity improves the development of self-care and mood regulation skills, lowers anxiety levels, increases self-esteem, and increases muscle strength, endurance and agility in individuals with disabilities.[5-9] It is also known that physical activity has a positive effect on the elimination of motor developmental retardation in children with intellectual disabilities.[10]

It is known that physical activity levels of disabled individuals are lower than healthy individuals, both among adolescence and adulthood.[11,12] The severity of disability in adults is reported to be a parameter predicting even lower levels of physical activity.[13]

Studies regarding the physical activity levels of Turkish individuals with disabilities are limited. One study that analyzed 45 children reported that physical activity levels of children with physical disabilities were significantly lower than that of with autism and intellectual disabilities.[14] Another study examined university students with disabilities and revealed that students with hearing loss or blindness were even less active than students with physical disabilities.[15] A review article analyzed the studies from Turkey regarding physical activity and autism spectrum disorder and reported that more studies from the Turkish population are needed.[16]

This study aims to determine and compare the physical activity levels of individuals with disabilities from various diagnosis groups and try to define the predictors of physical activity levels of individuals with disabilities.

MATERIAL AND METHODS

Before the initiation of this study, approval was obtained from the Ethics Committee of Pharmaceutical and Non-medical Device Researches of Necmettin Erbakan University Meram Medical Faculty (Decision Number: 2019/2074). Written informed consent was obtained from volunteers who have the ability to make decisions, and from the guardians of the participants who were not competent to make decisions or were underage. All reported research involving "human beings" were conducted in accordance with the principles set forth in the Helsinki Declaration 2008.

Individuals who applied to Ankara Çankaya Guidance and Research Center between 01.10.2019 - 01.12.2019 to receive a Special Education and Evaluation Board Report in line with their request for educational evaluation were invited to the study. The study was a single-centre study, which included only participants from the central district of Ankara. Subjects with orthopaedic disabilities, visual impairment and the ones under 15 years of age were excluded from the study. Eventually, a total of 275 participants (103 women and 172 men) were recruited, with a median age of 20 (IQR:5). One hundred and thirteen participants had intellectual disabilities, 87 participants had specific developmental disorder, 45 participants had pervasive developmental disorder, 17 participants had hearing impairment and 13 participants had specific developmental disorders of speech and language.

Within the scope of the research, in addition to the International Physical Activity Questionnaire - Short Form (IPAQ), a Participant Information Form

was also filled, in which the demographic and sociodemographic information of the volunteers and the diagnoses stated in the hospital report were questioned. IPAQ and the information form was filled in by the parents (or legal representatives) of all mentally challenged participants; children who were under 18 and who were not mentally challenged filled in the forms with their parents; finally participants who were above 18 and had no mental challenges filled in the forms by themselves.

The International Physical Activity Questionnaire is a measurement tool that calculates the level of physical activity over the last 7 days based on self-report.[17] It questions physical activity in three categories: high intensity, moderate intensity, and walking. Besides, it questions the daily average time spent sitting. Questionnaire results are calculated in MET minutes after multiplying the minutes spent doing high-intensity exercise by 8, moderate by 4 and walking by 3.3 and calculating the sum of all. The Turkish validity and reliability study of the IPAQ was conducted for individuals between the ages of 15-69.[18] According to the IPAQ results, people who have participated in severe physical activity for at least 3 days a week and have achieved a minimum of 1500 MET-minutes or a minimum of 3000 MET-minutes with varying intensity exercises are considered highly active. Individuals who scored a minimum of 600 MET-minutes from exercises of varying intensities; or had high-intensity physical activity 3 days a week and/or at least 30 minutes of walking each day; or moderate physical activity 5 days a week and/or at least 30 minutes of walking each day were considered moderately active. Those who did not meet the criteria of moderate activity were considered to be low active.[19]

The diagnoses were accepted as stated in the hospital report.

Intellectual disability levels were used exactly as indicated in the hospital reports and classified as mild intellectual disability (MID), moderate intellectual disability (MoID), severe intellectual disability (SID), and profound intellectual disability. (ICD codes are F70, F71, F72 and F73, respectively).[20]

The diagnosis of "Specific developmental disorder" (SDD) used in the study refers to all developmental disorders in scholastic skills. The sub- diagnoses included in this group are specific reading disorder, mathematics disorder, other developmental disorders of scholastic skills, developmental disorder of scholastic skills, unspecified. (ICD code F81).[20]

Diagnosis group "Pervasive developmental disorders" (PDD), which has the ICD-10 code of F84, includes all the following diagnosis: Autistic disorder, Rett's syndrome, other childhood disintegrative disorder, Asperger's syndrome, other pervasive developmental disorders and pervasive developmental disorder, unspecified.[20]

Hearing-impaired individuals refer to individuals in need of special education and support training services due to loss of hearing sensitivity partially or completely and are identified by H90 and H91 ICD codes in hospital reports.[20]

In the study, the diagnostic group which is expressed as "Specific developmental disorders of speech and language" includes the following diagnoses: Phonological disorder, expressive language disorder, mixed receptive-expressive language disorder, speech and language development delay due to hearing loss, other developmental disorders of speech and language, developmental disorder of speech and language, unspecified. (ICD code F80).[20]

In the study, the diagnostic groups were independent variables and the IPAQ results were dependent variables. The histogram and Shapiro test were used to determine whether the study data showed normal distribution. Demographic and sociodemographic characteristics and IPAQ results of the participants were analyzed with descriptive statistics. Kruskal-Wallis test was used to determine the difference between IPAQ total and subgroup results according to diagnostic groups. Post-hoc analysis was performed by Dunn-Bonferroni test and p values were corrected by Bonferroni method. A multiple regression analysis was carried out to analyze the predictors of physical activity levels. An *a priori* power analysis was conducted to calculate the minimum sample size for the multiple linear regression analysis. For a medium effect size (d=0.15), and a power of 0.90, several calculations were performed for numbers of predictors varying between 5-15. The analysis results returned a minimum

sample size between 109-154. Sample p-value of less than 0.05 was considered significant. All analyses were performed using R version 3.6.2.[21]

RESULTS

A total of 275 volunteers, 103 women and 172 men participated in the study. The median age of the participants was 20 (IQR:5). Demographic characteristics of the participants grouped according to their diagnosis are given in Table 1. Besides, some sociodemographic data belonging to the families of the participants are presented in Table 2.

International Physical Activity - Short Form results of the participants are presented in Table 3. Accordingly, 15% of the participants were highly active (n=42), 20% were moderately active (n=54) and 65% were low level active (n=179). Figure 1 shows the total weekly physical activity levels of the volunteers according to the diagnostic groups. Figure 2 displays the weekly MET-minutes related to walking and Figure 3 visualizes the daily average sitting time of participants.

According to Kruskal Wallis test results, total physical activity, high-intensity physical activity, walking amounts and daily average sitting time of the participants differed significantly between the diagnostic groups ($\chi^2(6)=28.15$, $p<0.001$; $\chi^2(6)=13.45$, $p=0.036$; $\chi^2(6)=20.63$, $p=0.002$ and $\chi^2(6)=22.04$, $p=0.001$, respectively). On the other hand, weekly MET-minutes due to moderate physical activity did not differ significantly between different diagnostic groups. ($\chi^2(6)=9.28$, $p=0.158$) (Table 3).

In light of these results, bilateral comparisons were made between the diagnostic groups. Post-hoc analysis has shown statistically significant differences in the weekly MET minutes due to walking between groups MoID and MID, MoID and SDD, MoID and PDD ($p=0.042$, $p=0.018$, $p=0.045$, respectively). Total weekly MET minutes were significantly different between groups SDD and SID, SDD and MoID ($p=0.012$, $p<0.001$, respectively). Additionally, sitting time of MoID group was significantly different than that of MID ($p=0.035$), SDD ($p=0.024$), PDD ($p=0.006$), and Language-Speech Disorders ($p=0.007$).

TABLE 1: Demographic characteristics of the participants.

Severe Intellectual Disability	n	9
	Age	24 (11)
	Sex	Female: 3 (33.3%)
		Male: 6 (66.6%)
Moderate Intellectual Disability	n	25
	Age	23 (13)
	Sex	Female: 14 (%56%)
		Male: 11 (44%)
Mild Intellectual Disability	n	79
	Age	20 (7)
	Sex	Female: 36 (45.6%)
		Male: 43 (54.4%)
Specific Developmental Disorder	n	87
	Age	20 (3)
	Sex	Female: 33 (37.9%)
		Male: 54 (62.1%)
Pervasive Developmental Disorders	n	45
	Age	18 (6)
	Sex	Female: 6 (13.3%)
		Male: 39 (86.7%)
Hearing Impairment	n	17
	Age	20 (4)
	Sex	Female: 9 (52.9%)
		Male: 8 (47.1%)
Language-Speech Disorders	n	13
	Age	17 (4)
	Sex	Female: 2 (15.4%)
		Male: 11 (84.6%)

Although the weekly MET minute levels due to high-intensity physical activity indicated a difference between the diagnostic groups in the Kruskal-Wallis test, no statistically significant difference was observed in the post hoc analysis.

Multiple linear regression was calculated to predict physical activity levels based on sociodemographic variables. Sex, diagnosis and postgraduate training of the father were significant predictors. A significant regression equation was found ($F(193,12)=2.211$, $p=0.01$), with an adjusted R^2 of 0.06. The intercept was 7.951. Estimates of coefficients were -11.19 for the female gender, 28.06 for MID, 33.02 for hearing impairment, 34.77 for SDD and 25.23 if the father has postgraduate training.

TABLE 2: Sociodemographic characteristics of the participants and their families.

Highest Education of the Mother (n=272)	Illiterate	14 (5.14%)
	Primary school	87 (32.0%)
	Middle school	31 (11.4%)
	High school	51 (18.7%)
	Graduate	77 (28.3%)
	Postgraduate	12 (4.4%)
Highest Education of the Father (n=249)	Illiterate	4 (1.6%)
	Primary school	56 (22.5%)
	Middle school	23 (9.2%)
	High school	70 (28.1%)
	Graduate	78 (31.3%)
	Postgraduate	18 (7.2%)
Number of Household (n=271)	2 people	15 (5.53%)
	3-4 people	176 (64.9%)
	5-6 people	71 (26.2%)
	7 people	9 (3.3%)

These questions contain incomplete data due to variable family structures.

TABLE 3: Physical activity levels and sitting times of the participants.

	High Intensity PA	Moderate Intensity PA	Walking	Total PA	Sitting Time
Severe Intellectual Disability	0.0 (0-480)	0.0 (0-120)	0.0 (0-248)	0.0 (0-732)	600 (300-1080)
Moderate Intellectual Disability	0.0 (0-480)	0.0 (0-2880)	0.0 (0-990) †	0.0 (0-3540)	600 (300-1080)**
Mild Intellectual Disability	0.0 (0-10080)	0.0 (0-5040)	264.0 (0-1458)	330.0 (0-12453)	390 (30-780)
Specific Developmental Disorder	0.0 (0-5040)	0.0 (0-6720)	247.5 (0-1980)	495.0 (0-7956) ‡	420 (0-900)
Pervasive Developmental Disorders	0.0 (0-5760)	0.0 (0-2880)	297.0 (0-2772)	445.5 (0-8904)	360 (120-840)
Hearing Impairment	0.0 (0-3840)	0.0 (0-1680)	297.0 (0-1386)	592.5 (0-4533)	480 (60-660)
Language - Speech Disorders	0.0 (0-2400)	0.0 (0-420)	148.5 (0-1386)	231.0 (0-3628)	300 (180-600)
Kruskal-Wallis test outcome	χ^2: 13.448 df: 6 **p= 0.037***	χ^2: 9.285 df: 6 p= 0.158	χ^2: 20.628 df: 6 **p= 0.002**	χ^2: 28.149 df: 6 **p<0.001**	χ^2: 22.042 df: 6 **p= 0.001**

Results are given as "median (minimum - maximum)".

PA: Physical Activity

High intensity PA, Moderate intensity PA, walking and total PA levels are given as "MET-minutes/week", sitting time is given as "minutes/day".

* Despite the significant Kruskal-Wallis test result, no statistically significant difference was observed between groups in the post hoc analysis.

** Post hoc analysis revealed that sitting time of MoID group is significantly different than that of MID (p=0.035), SDD (p=0.024), PDD (p=0.006), and Language-Speech Disorders (p=0.007)

‡ Post hoc analysis revealed that total PA levels of SDD group is significantly different than that of SID (p=0.012) and MoID (p<0.001)

† Post hoc analysis revealed that MoID group's weekly MET-minutes due to walking is significantly different than that of MID (p=0.042), SDD (p=0.018), PDD (p=0.045).

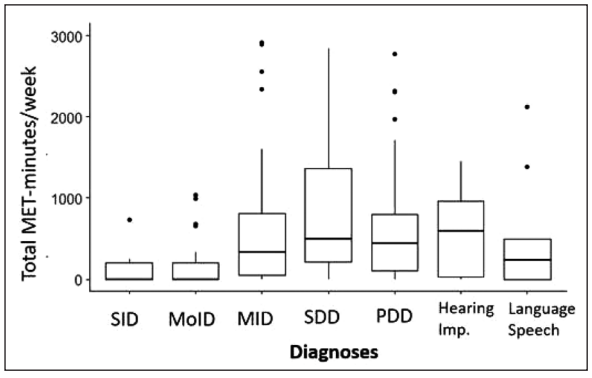

FIGURE 1: Total weekly physical activity levels of the participants according to their diagnosis **SID:** Severe Intellectual Disability; **MoID:** Moderate Intellectual Disability; **MID:** Mild Intellectual Disability; **SDD:** Specific Developmental Disorder; **PDD:** Pervasive Developmental Disorder.

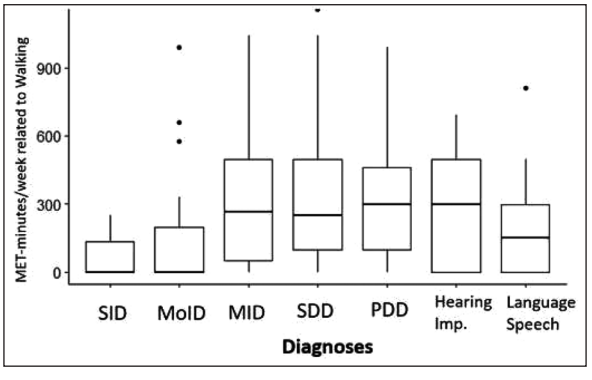

FIGURE 2: Weekly MET-minutes of the participants related to walking. **SID:** Severe Intellectual Disability; **MoID:** Moderate Intellectual Disability; **MID:** Mild Intellectual Disability; **SDD:** Specific Developmental Disorder; **PDD:** Pervasive Developmental Disorder.

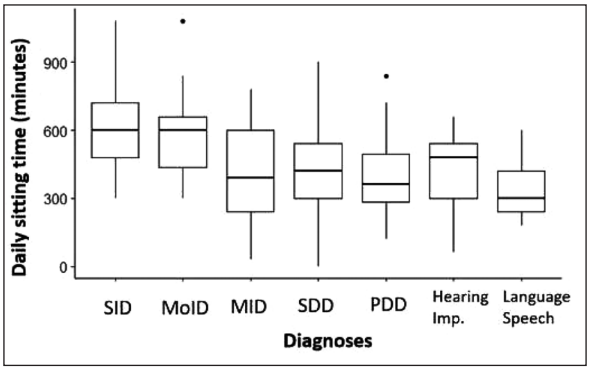

FIGURE 3: Daily average sitting time of participants. **SID:** Severe Intellectual Disability; **MoI:** Moderate Intellectual Disability; **MID:** Mild Intellectual Disability; **SDD:** Specific Developmental Disorder; **PDD:** Pervasive Developmental Disorder.

DISCUSSION

Study results have demonstrated that physical activity levels of individuals with disabilities vary significantly with regard to their diagnoses. Highest physical activity levels were observed among individuals with hearing impairment, whereas having an intellectual disability (ID) was associated with lower physical activity levels. Participants with severe ID scored the lowest. This finding is supported by other studies in the literature as well. A systematic review has revealed that the severity of ID is the strongest predictor of low physical activity.[13]

Although certain disabilities, such as severe ID, are associated with even lower physical activity levels, it should be emphasized that 65% of all participants in our study had low physical activity levels. Other studies have also demonstrated significantly low activity levels among people with disabilities. For example, Oviedo et al. have reported that only 10.7% of the people with ID met the global recommendations on PA for health.[22] In another study, accelerometry data of 294 individuals with ID showed that 23.7% met recommended PA guidelines.[23] Keeping in mind that minimum physical activity recommendations are the same for healthy people and people with disabilities, low levels of activity among disabled people need immediate attention. Policymakers need to take action to eliminate the barriers that prevent people with disabilities to live more active and engage in more exercise. For instance, Finlayson et al. have suggested that promoting work based activity through an increase in the number of paid or supported employment opportunities made available for, and taken up by, adults with ID may increase activity levels.[24] Other authors have suggested implementing an "active support" program, which includes involving adults with ID in home-based activities and the day to day upkeep of their homes.[25] Another study has revealed that attending day/educational programs or being employed were associated with spending less time watching TV. Therefore the authors claimed that a key strategy aimed at increasing physical activity should include promoting participation in social and community activities and

providing day programs or employment opportunities for adults with intellectual disabilities.[12]

Physical activity levels of individuals with pervasive developmental disorder deserve special attention, as patients with PDD are more prone to weight gain and obesity.[26] Bandini et al. have reported that children with autism spectrum disorder have participated in significantly fewer types of physical activities and fewer hours per year of activities compared with their typically developed counterparts when measured by parent-report.[27] Also, Dreyer-Gilette et al. reported that a significantly higher per cent of children with PDD spent no days being physically active in comparison to their typically developed peers.[28] Our study design does not include typically developed individuals, therefore making such comparisons is not possible. However, it can be observed from the results of this study that individuals with PDD had more physical activity and less sedentary time compared to ones with intellectual disabilities.

One study shows that hearing sensitivity is not associated with objectively measured physical activity levels among adolescents, young adults or old adults.[29] Although there is not much research regarding physical activity levels of people with hearing impairment, the study of Loprinzi et al. which studied a sample of 1,880 participants aged between 12-85, report clearly that there are no differences in physical activity levels among people who have worse hearing compared with people who have good hearing. In our study, we found out that individuals with hearing impairment had the most total weekly physical activity compared to other diagnosis groups. Similar to the individuals with hearing impairment, physical activity of children with developmental language disorders is not different from that of typically developed peers.[30] However, they displayed significantly lower physical fitness. Unfortunately, scientific literature lacks data related to physical activity and physical fitness levels young and old adults with language developmental disorders. Our study results are somewhat contradictory to the very limited literature. We report a lower median total PA in language disorder group, compared to several other diagnosis groups such as hearing impairment, PDD, SDD and MID. More research is warranted regarding PA and fitness levels of individuals with hearing impairment and language disorders. When it comes to learning disorders, discussed in this article under the SDD diagnosis group, it also is related to less participation in sports activities and more sedentary time in adolescents in the literature.[31] Individuals with SDD in our study group were quite active in comparison to the other diagnosis groups but we do not know if they are less active than their typically developed peers.

Predictors of physical activity were also investigated in this study. Sex was found to be a significant predictor. In most studies females with disabilities have lower activity levels than males, similar to healthy populations.[32,33] However, some studies report similar levels of daily physical activity in male and female individuals with intellectual disability.[34] Our study results are in agreement with the majority of the literature, which suggests that female gender is a negative predictor of physical activity. Other predictors of physical activity in individuals with disabilities defined in the literature include the severity of ID, age, sex, obesity, living in care, mobility limitation, health problems and social-environmental factors (e.g., community participation, social support residential settings, access to facilities, neighbourhood safety).[12,35] Our study has revealed that the father's postgraduate education was a significant predictor of higher physical activity as well. Maternal education level was not a predictor. On the contrary, Orsmond et al. found out that maternal education level was significantly associated with specific discretionary activities including the physical activity of adolescents with an autism spectrum disorder in the USA.[36] This discrepancy can be attributed to cultural determinations because most families have a patriarchal structure in Turkey. Whether paternal postgraduate education is a determinant or only a predictor of physical activity is to be questioned. Although it can be speculated that a direct causal relationship between paternal education level and physical activity level of the child is possible, it is also reasonable to argue that paternal educational level is only a sign of the socio-economic status of the family, a factor that has not been investigated in this study.

A limitation of this study is that physical activity is measured with a self-reported questionnaire. Al-

though self-reported physical activity levels are generally in good agreement with objectively measured physical activity, some studies have revealed that self-reported sitting hours are generally underestimated, whereas physical activity is overestimated.[37–39] Therefore, the results of our study should be considered as relatively conservative findings regarding the sedentary behaviour of people with disabilities. It is reasonable to estimate that they have even less physical activity and more sitting hours than they have reported. While our research findings are remarkable enough, this magnifies the importance of our findings.

CONCLUSION

This study has revealed that the majority of the people with intellectual disabilities, hearing impairment, language-speech disorders, specific developmental disorder and pervasive developmental disorder do not meet the minimum physical activity recommendations. People with hearing impairment were the most active and people with severe intellectual disability were the least active. As reported similarly in the literature, sex and diagnosis were found to be significant predictors of physical activity. This study has determined paternal postgraduate education as a new predictor of physical activity in people with disabilities.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

This study is entirely author's own work and no other author contribution.

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