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Turning our eyes to the health of individuals with intellectual disabilities

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Abstract: It is important to know whether people with intellectual disabilities meet the minimum recommended levels of physical activity which correspond to 10,000 steps per day as they are an important determinant of their health.For this purpose, research was carried out in which a total of 33 people with intellectual disabilities from Greece, aged between 14 and 25 years old, attended creative employment programs after completing school lessons, took part. To test whether there are differences in total daily and weekend pedometric physical activity between people with intellectual disabilities and the guidelines, a one sample T-test analysis was performed and showed that people with intellectual disabilities perform significantly fewer steps per day and in the three conditions. Next, the effect of the factor BMI and age on the total weekday and weekend was investigated. These results showed that BMI is not a limiting factor as the participants performed approximately the same number of steps in all three conditions. On the other hand, age separated the participants with the youngest participants taking fewer steps than the oldest. In conclusion, people with intellectual disabilities do not manage to achieve the guidelines, as a result of which they cannot obtain the expected benefits. Special attention needs to be paid to this population as their health is at greater risk.
Keywords: physical activity, pedometers, walking, adults, adolescents,

1. Introduction

Intellectual disability (ID) is a condition that appears from the beginning of childhood, and is characterized by a limitation of both intelligence and adaptive abilities (AAIDD, 2022). People with ID, a very heterogeneous group, represent approximately 1% of the population with 85% of them having a mild intellectual disability (APA, 2022). Compared to their peers, children with intellectual disabilities experience more health problems than the general population (Hughes-McCormack, 2018), such as hypertension, diabetes, hypercholesterolemia, Metabolic Syndrome (de Winter et al., 2012; Van Schrojenstein et al., 2007), low bone density but also mental health problems such as depression, dementia, anxiety and psychotic, and personality disorders (Einfeld, Ellis, & Emerson, 2011; Emerson, 2003) leading to premature death up to 20 years (O' Leary, Cooper, & Hughes-McCormack, 2018).

Although a physically active lifestyle has been linked to positive health benefits, the majority of children and adolescents are not as physically active as they should be (Kovacs et al., 2022; Guthold, Stevens, Riley,& Bull, 2020). Recent data from the American Heart Association demonstrate an increase in the prevalence of non-communicable diseases and a decrease in physical activity levels in both children and adults (Tsao et al., 2022). Low levels of physical activity (PA)and a sedentary lifestyle should concern us all as 6 to 10% of the most common non-communicable diseases are due to inactivity (Lee et al., 2012). In addition, NCDs now account for 7 of the 10 most common causes of death worldwide according to the 2019 WHO Global Health Estimates in people of typical development (WHO, 2020).

Recognizing the linear relationship between physical activity and health status (Sallis et al., 2015) the WHO has issued specific guidelines for physical activity and sedentary life for 2020 for children, adolescents, adults and people with chronic conditions or disabilities that young people should participate in at least 60 minutes of moderate to vigorous physical activity daily and adults 150–300 minutes of moderate intensity or 75–150 minutes of vigorous physical activity or some equivalent combination of moderate and vigorous aerobic physical activity per day week in order to obtain the necessary health benefits (Bull et al., 2020). Accordingto the World Health Organization, healthisdefinednotsimplyas the absence of diseasebutas a state of completephysical, mental and socialwell-being (WHO, 1948).

A satisfactory level of physical activity has been linked to better cardiovascular fitness, musculoskeletal fitness, cardiometabolic risk factors (Ginis et al., 2021), enhancement of emotional states, improvement of self-

confidence, and increase in perceived social acceptance (Vogt et al., 2012), lower levels of anxiety, reduced risk of depression (Carmeli et al. 2008; Carraro, & Gobbi, 2012), reduction of stereotyped behaviors (Prupas, &Reid, 2001), better social skills and more positive self- perception of people with AD (Dykens & Cohen, 1996), independence and quality of life in people (Bartlo, & Klein, 2011), while low levels of PAhave been linked to high rates of chronic diseases in people with intellectual disabilities (Hinckson, & Curtis, 2013; Temple, Frey & Stanish, 2006; Robertson et al., 2000). These reasons demonstrate that this population may need more attention and the need to increase levels of physical activity, leading researchers to attempt to assess and determine the level of PAof this population (Hinckson & Curtis 2013).

Physical activity is assessed using subjective and objective methods. The former includes diaries and questionnaires recording PA, which, however, when used by children, do not provide accurate data either because children forget daily activities (especially when the day is unstructured like the weekend), or because they tend to overestimate their PA(Michalopoulou et al., 2009). In addition, the occasional, unplanned and spontaneous nature of young children's activities and the amount of time older children spend outside the home despite engaging in regularly scheduled sports activities make it difficult to objectify responses (Armstrong, 2012). Problems of objectivity and, by extension, validity are also created in the recall of frequency and duration, especially when it was less than 10 minutes of people with intellectual disabilities (Bowns et al., 2016; Matthews et al., 2011;Stanish,&Draheim, 2005).

Of the objective methods, the most used are pedometers and accelerometers. Pedometers are a relatively cheap and easy way to quantifyPA (McClain,& Tudor-Locke 2009; Tudor-Locke,& Myers, 2001) and appear to be a good option for monitoring the PA of young people, children and people with special educational needs. Walking is a very popular and low-risk (Barnes et al., 2013; Pate et al, 1995), aerobic activity, with few adverse side effects, and is performed by almost everyone (Morris,& Hardman, 1997). Intensity, duration, and frequency are self-regulating and therefore safe, year-round, easily repeated, addictive, show little if any decline in middle age, and are the primary choice for increasing physical activity in sedentary populations (Morris,& Hardman, 1997). Furthermore, it is an alternative proposition on most, if not all, days of the week and it is internationally recognized that 10,000 steps per day may provide the expected health benefits (Tudor-Locke,& Bassett, 2004) although there is evidence that benefits for health it is possible to obtain between 7,500 - 9,999 steps per day (Marshall et al., 2009; Rowe, Kemble, Robinson, & Mahar, 2007). According to Colley, Janssen and Tremblay (2012), the recommended physical activity levels of 60 minutes of daily MVPA recommended by the WHO correspond to 12,000 steps per day.

Although walking can be a convenient and inexpensive way through which the guidelines could be reached, people with N.A. (Stanish, & Draheim, 2005; Temple, Anderson, & Walkley, 2000), recent data demonstrate that the physical activity levels of people with special needs and especially people with ID are lower compared to the typical population (Leung, Siebert, & Yun, 2017; McGarty, Downs, Melville, & Harris, 2017; Dairo, Collett, Dawes, & Oskrochi, 2016). In particular, regardless of age, a small percentage manage to achieve the recommended levels of physical activity in the Netherlands (Hinckson, & Curtis, 2013), in the East and South East of England (Phillips,& Holland, 2011), in the United Kingdom (Finlayson, Turner, &Granat, 2011), in the USA (Stanish et al. 2019; Segal, et al. 2016; Dixon-Ibarra, Lee, &Dugala, 2013), in Canada (Temple, 2007; Stanish, & Draheim, 2005; Stanish, 2004), in the northwest of England (Bowns et al., 2016), in Iceland (Einarsson, Jóhannsson, Daly, & Arngrímsson, 2016), in Norway (Nordstrøm, Bjørge, Paus. &K olset, 2013), in Hong Kong (Sit et al., 2020; Sit, McManus, McKenzie & Lian, 2007), inChina (Yuan, et al. 2022), in Spain (Queralt, Vicente-Ortiz, & Molina-García, 2016; Izquierdo-Gomez et al., 2014),in Sweden (Sundahlet al., 2016), in Greece (Petridou, & Margaritou 2021; Petridou, 2019; Petridou et al., 2016; Tehlikidou et al., 2015).

Considering that it is important to know whether people with mental disabilities meet the minimum recommended levels of physical activity as they are an important parameter in determining their health, in this research we wanted to investigate the levels of physical activity of people with mental disabilities from Greece and specifically the region of Komotini, a provincial town in Eastern Macedonia Thrace using objective methods. Individual objectives of the research were a) the differentiation of the PA level in terms of age and c) in terms of BMI. In particular, the following questions were investigated in this research:

(1). There are differences between the total pedometric physical activity of people with intellectual disabilities and the minimum of 10,000 steps recommended for most, if not all, days of the week?
(2). There are differences in the pedometric physical activity of people with intellectual disabilities daily, at the weekend and overall, of people with intellectual disabilities from Greece in terms of the BMI factor?
(3). There are differences in the pedometric physical activity of people with intellectual disabilities daily, at the weekend and overall, of people with intellectual disabilities from Greece in terms of the age factor?

The results of this research will contribute to the assessment of the level of physical activity of people with ID, hoping to reduce hypoactivity and obesity with the ultimate goal of improving their quality of life. In

addition, the results of this research can form the basis on which activities will be organized by public and private bodies of alternative forms of exercise for the population group in question.

2. Methodology

2.1 Participants

In total, 33 people with intellectual disabilities from Greece who attended creative work programs after completing school lessons took part in the research which was carried out in the spring of 2016 aged 14 to 25. The mother of an autistic student refused her child's participation in the research procedure without justifying its refusal. This came as no surprise as other parents have refused their children's participation due to the risk of their children being labeled "different"(Davis et al.,2012).

2.2 Measuring instruments

2.2.1 Anthropometric characteristics

Measurements of height without shoes were made with a measuring tape (to the nearest centimeter of 0.1 cm), and body weight with a precision digital scale of the company with an accuracy of 0.1 kg. If a deviation of 0.10 kg was found during the measurement (Lohman, Roche, & Martorell 1988) the procedure was repeated until the desired result was achieved. Height was recorded in meters and centimeters while weight was recorded in kilograms and grams.

2.2.2. Calculation of Body Mass Index

For the indirect assessment of obesity, the body mass index (BMI) was calculated, which is considered the most appropriate method of measuring body fat in people with intellectual disabilities (Litchford, 1987) and is defined as the quotient of body weight in kilograms by height in meters square (kg/m2). Participants under 18 were classified by gender and age according to internationally accepted BMI cutoffs into underweight, normal, overweight, and obese (Cole, Bellizzi, Flegal, & Dietz, 2000). Participants' age was obtained by subtracting the date of birth from the date of measurement.

2.2.3. Assessment of Physical Activity

For the assessment of physical activity, a piezoelectric pedometer (Omron HJ-112) was used, which has two motion sensors and is most often used in studies (Hinckson & Curtis 2013). Before the pedometers were placed they were numbered and each student corresponded to a number.

2.3 Procedure

The centers of creative employment were identified and then the parents of the children were informed about the purpose of the research. It was emphasized to the parents that all the data for the conduct of the research will remain confidential, coded, no reference is made to the names of the participants, thus protecting the personal data of the participants and that their children can withdraw from the research process at any time they wish

Pedometers were worn for seven consecutive days, bearing in mind that opinions on how many days pedometers should be worn are conflicting (Kim, & Yun, 2009), but also the fact that in 61% of surveys pedometers are worn for 7 days). (Tudor-Locke, Hart, & Washington, 2009). The participants wore the pedometers from the time they woke up until they went to bed and took them off when they bathed. The back right position at the height of the hip of the right leg was preferred as it is out of the participants' field of vision as the usual recommended placement position (on the left hip) increases error rates in subjects with ID. while a posterior left/right hip position provides more accurate measurements while reducing behavioral interference (Pitetti, Beets& Flaming, 2009; Beets et al., 2007). Parental consent was a necessary condition for participation in the research.

2.4 StatisticalAnalyses

Statistical analyzes were performed with SPSS IBM 20.0 (Statistical Package for the Social Sciences). Descriptive statistical analysis of frequencies (means and standard deviations) was used to find the overall BMI. For the 1st research question, a one sample T-test analysis was performed to test if there were differences in total pedometric physical activity between people with intellectual disabilities and the guidelines. Although guidelines vary among different populations (Tudor-Locke,& Myers, 2001), it is recommended that individuals to benefit and reap health benefits should perform a minimum of 10,000 steps on most, if not all, days. of the week (Tudor-Locke,& Bassett, 2004). So, the comparison was made according to 10,000 steps/day.

For the 2nd research question, a T-test analysis was performed regarding an independent factor (T-test) to test whether BMI has a statistically significant effect on the dependent variable. For the 3rd research question,

a T-test analysis was performed as an independent factor to test whether age has a statistically significant effect on the dependent variable. BMI included two categories as did age. In particular, the participants were divided into those who had a normal weight and those who did not have an increased BMI. The age factor also included two categories. In the first category were included those whose age was up to 17.11 months and in the second those who were over 18 years old. The dependent variable was defined as total pedometric physical activity as well as the steps taken by the participants on weekdays and at the weekend. Significancelevelwassetat .05

The statistical hypotheses of this research were:
(H1) Levels of total pedometric physical activity of people with intellectual disabilities will not be lower than the minimum recommended levels of 10,000 steps.
(H2) There will be no statistically significant difference between the age and the BFD of the participants.
(H3) There will not be a statistically significant difference between the BMI and BFD of the participants.

3. Results

The demographic characteristics of the sample are shown in Table1.

Table 1. Demographic characteristics(mean ± SD)

	N	Minimum	Maximum	Mean	Std. Deviation
Weight.	33	32,0	110,0	71,003	20,5485
Height.	33	135	181	165,82	10,798
Age	33	14	25	19,30	3,3376
Sample BMI	33	15,43	37,73	25,57	

Descriptive frequency analysis of means (M.O.) and standard deviations (SD) was used to find the total, daily and weekend physical activity of participants with intellectual disabilities who took part in the research. The resultsarepresented in Table 2.

Table 2. Pedometric Physical Activity 7 days, in total, every day and on the weekend (mean ± SD)

	N	Mean	Std. Deviation	Std. ErrorMean
Total	33	5632	2939,579	511,715
Weekdays	33	5901	3115,408	542,323
Weekend	33	5784	4409,688	767,628

The one sample analysis was conducted to evaluate Hypothesis 1 (that the BPD of people with intellectual disabilities will not differ significantly from the minimum recommended levels). The results showed that people with intellectual disabilities have lower levels of total pedometric physical activity (M = 5632.6, SD = 2939.5) than those suggested to obtain health benefits, $t(32) = -8.535$, $p < .001$. Similar low levels were found on weekdays $t(32) = -7.557$, $p < .001$ (M = 5901.53, SD = 3115.4) but also on weekends $t(32) = -11.266$, $p < .001$ (M = 5784, SD = 4409.688) (Table 3).

Dependent T-Test was conducted to evaluate Hypothesis 2 (that the total pedometric physical activity would not differ statistically significantly between people with intellectual disabilities under the age of 18 and those who were 18 years and older). The results showed that the 17 participants from 18 years and over (M = 6896, SD = 3264.66) compared to the 16 participants under 18 years (M = 4289.57, SD = 1825.120) demonstrated better scores in the overall pedometric physical activity, $t(25.403) = -2.853$, $p < .005$. Regarding the existence of differences in daily physical activity, the results showed that the 17 participants from 18 years and over (M = 7245, SD = 3439.54) compared to the 16 participants under 18 years (M = 4473, SD = 1965, 49) demonstrated better scores in daily pedometric physical activity, t(25,725)=-2,863, p<.005. Finally, similar results were found on weekends. Specifically, the results showed that those who were 18 years old and over (M = 6024, SD = 2912.68) demonstrated better scores in pedometric physical activity on weekends than those who were under 18 years old, $t(24,660) = -2.724$, $p < .005$ (Table 4).

Dependent T-Test was conducted to evaluate Hypothesis 3 (that pedometric physical activity would not differ statistically significantly between underweight and normal weight and overweight and obese individuals with intellectual disabilities). The results showed that the 18 participants with normal weight (M = 6555.05, SD = 3798.592) compared to the 15 overweight/obese participants (M = 4863.90, SD = 1733.848) demonstrated

similar scores in the total pedometric physical activity, t(18,816) = 1.592, p > .005. Regarding the existence ofdifferences in daily physical activity, the results showed that the 18 participants with normal weight (M = 6830, SD = 4069.63) compared to the 15 overweight/obese participants (M = 5128.21, SD = 1799.287) demonstrated similar scores in daily pedometric physical activity, t(18,528)=-1,501, p>.005. Finally, similar results were found on weekends. Specifically, the results showed that those who had a normal weight (M = 5869, SD = 3201.63) demonstrated similar scores in pedometric physical activity than the overweight/obese (M = 4203, SD = 1628.34) on weekends, t(19.924) = 1.828, p > .005 (Table 5).

4. Discussion – Conclusions

The results of the present research using objective methods of assessing physical activity confirm and provide additional evidence for the low levels of physical activity of people with ID mentioned in the international literature (Petridou, 2019; McGarty, Downs, Melville, & Harris, 2017;Petridouet al., 2016). Furthermore, we provide evidence that physical activity levels differ between weekdays and weekends with people with intellectual disabilities in the present study being less physically active on weekends. Our results are in contrast to those found in the study by Izquierdo-Gomez et al. (2014), where people with Down syndrome were similarly physically active on weekdays and weekends. However, in general the number of steps they take varies within the expected limits that have been observed in special populations where average recorded steps range from 1,200 steps/day to 8,800 steps/day (Tudor-Locke et al., 2011).

Possibly the reasons that led to these results are due to the overprotection that parents often show their children regardless of their age. Thus, even though the participants of the present research were teenagers and adults, the chances of them being allowed to move alone are few and consequently the opportunities to participate in activities with other children in the afternoon are also reduced. There is evidence that parental overprotection may prevent some children with ID from exploring their environment and participating in activities with other children, thus limiting their opportunities to maintain an active lifestyle (Blick et al., 2015). Furthermore, even among individuals with developmental disorders motivations may differ and special care must be taken to ensure that children with intellectual disabilities understand what it means to be active (Einarsso et al., 2016). According to Whitt-Glover et al. (2006), the high educational level (86%) and economic surface (55%) of the families may have contributed to the participation of children with ID in organized activities on a weekly basis. While factors such as having different developmental disorders (Nordstrøm et al., 2013), lead to different levels of physical activity.

The higher, although not, recommended physical activity occurring between daily PA and weekend PA is likely due to school. Schools are a potentially attractive setting for promoting positive health behaviors because students spend a large portion of their day there where appropriate programs and interventions could be used to promote health (Pate et al., 2006). The contribution of the school to the increase of PA levels has been highlighted by a number of studies among people with ID (Queralt et al., 2016; Sundahl et al., 2016; Tehlikidou et al., 2015; Brusseau et al., 2013). The participants of the present research, despite their age, were all secondary school students. According to Greek legislation, these children complete their education in eight years, unlike children without mental disabilities. In a similar way, attendance at primary education works with the cumulative effect that when they finish school, they are much older than the age of 18. However, the timetable of the lessons is regulated by the Greek Ministry of Education and according to this the students can do two hours of gymnastics in the first three classes of high school and one in the last three. It is clear that the provision and promotion of physical activity should not be limited exclusively to the school as this does not seem to be enough as many times the school fails to achieve the guideline recommendations (Einarsson, Jóhannsson, Daly, & Arngrímsson, 2016; Faison-Hodge, & Porretta, 2004), either because syllabi should be modified (Queralt et al., 2016) to aim in this direction, or because PE teachers mainly focus on learning motor skills (Sit et al., 2007).This disadvantage of the school came to cover the programs and activities that take place after the end of the school program and which can provide additional opportunities to increase the PA (Alesi, & Pepi, 2017; Haney et al., 2014), therefore also the opportunity to achieve the goal of 10000+ steps per day. In Greece, the creative employment centers for people with disabilities were recently created, which, however, do not emphasize the physical activity of the employment of people with disabilities, which, however, emphasize physical activity.In addition, the lack of special sports programs in the afternoons and the availability of private gyms with qualified coaches in which these children could participate, as well as the few hours of physical education in schools, reduce the opportunities of these people with intellectual disabilities to achieve the recommended minimum levels physical activity in order to obtain the benefits that these promise for his health.

With obesity levels being almost twice as high as their peers without intellectual disability (Segal et al., 2016), the low levels of physical activity found in this study are particularly worrying. However, it is encouraging that our results showed that BMI was not a limiting factor in the PAof people with AD, with obese and overweight people with ID being physically active to a similar extent as underweight and normal weight

individuals. Our results are in agreement with Queralt et al. (2016), and demonstrate that other factors influence the physical activity levels of people with cognitive impairment in contrast to the typical population that obesity leads to lower levels of physical activity. But they are in contrast with other researchers who found that BMI affects the physical activity levels of people with intellectual disabilities ((Nordstrøm, et al. 2013)

To investigate any differences between total physical activity and age, it was considered appropriate to categorize the participants into two subgroups. The first included the students who were under 18 and the second from 18 and over. The results of the survey showed that neither subgroup met the health-recommended levels of physical activity, with younger students at greater risk than older people with intellectual disabilities both overall and during weekend and daily. In the present research, the inverse relationship between age and physical activity that has been observed in a number of studies in people with ID as well as in people of the typical population was not proven (Izquierdo-Gomez et al., 2014; Barnes et al., 2013; Michalopoulou et al., 2011). However, they are in agreement with Yuan, et al. (2022), who found a decreasing trend with increasing age in children and adolescents from 6 to 18 years of age from Northern China. The results of the present research are particularly alarming if we consider the faster onset of old age, the faster decline in physical abilities (Fernhall, Pitetti, Stubbs & Stadler, 1996; Pitetti& Campbell, 1991), the possibility that children with special needs may need an even greater amount of PD compared to individuals in the typical population (Sit et al., 2007), and that habits that begin in adolescence are consolidated and continue for many years even during adulthood (Izquierdo-Gomez et al., 2011). Although we cannot know precisely why older students appeared more active than younger students, it appears that younger students may be driven to even lower levels of activity in later years, faster loss of function, and by extension worse quality of life. It is important to investigate the reasons why we were led to this result and to develop methods to deal with the reduced PA. In conclusion, it is considered imperative to investigate the reasons why we were led to this result and to immediately organize suitable holistic interventions to promote physical activity. activity of this population and mainly of the younger children. By reducing inactivity, many of the health problems experienced by this population and which are also a consequence of the modern lifestyle can be controlled and people with mental disabilities can improve their quality of life.

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