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Relationship between Physical Activity Levels, Lower Limb Muscle Strength, and Aerobic Capacity in Children with Intellectual Disabilities

Badriya Al-Hadabi[1], Heba El-Ashkar[1], Fadi Fayad[2]*
[1]*Physical Education and Sports Sciences Department, College of Education, Sultan Qaboos University, Oman;*
[2]*Physical Education and Sports Department, Faculty of Education, Lebanese University, Lebanon*
Corresponding Author: Fadi Fayad, E-mail: fadiify1977@gmail.com

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ABSTRACT

Background: Due to their frequent inactivity, children with intellectual disabilities are more likely to be obese and experience other health problems. Early evaluations of physical activity can lower health risks and increase activity levels. **Objectives:** This study aims to evaluate physical activity levels and determine their relationship with lower limb muscle strength and aerobic capacity in school students with intellectual disability. **Methods:** Fifteen female school students (12.4 ± 2.1 years) with intellectual disabilities were recruited purposively in this descriptive cross-sectional study. Physical Activity (PA), lower limb muscle strength, and Aerobic Capacity were assessed during regular school days using a triaxial accelerometer, countermovement vertical jump (CMJ - FCMJ) tests, and the 6-minute walk test, respectively. **Results:** Physical activity level was generally low (22 min/day of combined MPA and VPA), while the inactivity level was high (8 hours, 45 minutes/day). Inactivity or sedentary behavior (SB) significantly decreases lower limb muscular strength (CMJ, r = -0.559 and FCMJ, r = -0.609). However, muscular strength is significantly increased by light PA (CMJ, r = 0.411 and FCMJ, r = 0.475), moderate PA (CMJ, r = 0.411 and FCMJ, r = 0.449), and vigorous PA (CMJ, r = 0.699 and FCMJ, r = 0.666). Results also showed that the longer the daily vigorous activity was, the higher the aerobic capacity would be (r = 0.890). **Conclusion:** Adopting programs to improve lifestyle and physical activity for children with intellectual disabilities is crucial. Research should include larger and diverse samples and track activity over weekends.

Key words: Physical Activity, Motor Skills, Muscle strength, Lower Extremity, Aerobic Capacity, Intellectual disability, Functional Mobility.

INTRODUCTION

Because it enhances general fitness and well-being, physical activity is crucial for preserving good health, particularly for children with intellectual disabilities (ID). Lower levels of physical activity, physical fitness and functional limitations are common among children with ID (Hernandez et al., 2023). These physical profiles may be attributed to the following factors: sedentary lifestyle (Lotan et al., 2004); limited mental capacity and short attention span (Vuijk et al., 2010); limitations and impediments in motor development (Hartman et al., 2010); and lack of motivation to give it one's all during testing (Halle, Gabler-Halle, & Chung, 1999). People with ID are more likely to be obese and to suffer from related disorders, including diabetes and heart issues, because they are more likely to be sedentary (Einarsson et al., 2016).

Numerous studies have been conducted on children's levels of physical activity and compliance with WHO recommendations (Powell et al., 2011; Gomes et al., 2017; Pereira et al., 2017; Pate et al., 2002; Case et al., 2020; and Beets et al., 2011). There is a dearth of studies, though, that concentrate on kids with ID in educational environments. Children with ID are 40% less active than their classmates, with activity levels fluctuating between weekdays and weekends (Einarsson et al.,2016; Lin et al. (2010). Reduced fitness components are one of the detrimental health effects of inactivity (Calders et al., 2012). The lack of adaptive physical exercise programs is the primary cause of the physical fitness, balance, and coordination issues children with ID encounter (Sumaryanti et al., 2022).

Studying the physiological effects of daily physical activity is challenging (Kohl et al., 2000), particularly in individuals with ID due to sensory impairments, motor delays, and communication issues (Wouters et al., 2017). Traditional methods like self-reports are often inaccurate, especially in children under ten (Kohl et al. 2000). Objective methods, including heart rate monitors (HRMs) and pedometers, also have limitations. HRMs are influenced by factors like age, body size, and fitness (Trost 2001), while pedometers measure only activity volume, not intensity or duration (Trost

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2001). Accelerometers represent a breakthrough in measuring children's physical activity, providing objective data on frequency, duration, and intensity, and can be used over extended periods, offering more accurate results (Trost 2001). Tools like the ActiGraph GT3X (Migueles et al., 2017) are preferred in both field and lab settings, offering more reliable data than traditional methods. However, large-scale studies linking accelerometers with aerobic fitness are still lacking. In this regard, an objective assessment of aerobic endurance is offered by the 6-minute walk test (Li et al., 2007). On the other hand, lower limb muscular strength, including joint power and neuromuscular activation, could be measured with different methods, such as the countermovement jump test (Hassani et al., 2013).

For children, particularly those with ID, lower limb muscle strength and aerobic ability are essential for movement, independence, and general well-being. Lower limb strength and aerobic capacity directly impact a child's ability to walk, climb stairs, and participate in leisure activities, even though other fitness factors like flexibility and body composition contribute to health (Blair & Morris, 2009). By encouraging muscular growth, cardiovascular efficiency, and general fitness, physical exercise is essential for enhancing these aspects (Ruiz et al., 2009).

Strength in the lower limbs is crucial for balance, coordination, and movement efficiency—all of which are frequently compromised in children with ID as a result of motor dysfunctions (Hartman et al., 2010). It is unclear how weight-bearing and resistance training affects kids with ID, despite the fact that they can improve strength (Blomqvist et al., 2013). According to research, students with ID have inferior lower limb strength, as seen by altered muscle activation patterns, lower CMJ performance, and decreased take-off velocity, knee joint power, and stiffness (Hassani et al., 2014; Hernández et al., 2023).

For endurance and general health, aerobic capacity—a measure of the respiratory and cardiovascular systems' capacity to provide oxygen during prolonged activity—is essential. Children with ID may become more sedentary due to early exhaustion and decreased engagement in social and physical activities brought on by low cardiovascular fitness (Fernhall & Pitetti, 2001). Due largely to a lack of physical activity, studies show that children with ID typically have lower aerobic fitness than their classmates (Golubović et al., 2012; Hartman et al., 2015; Sumaryanti et al., 2022). Improving functional outcomes requires understanding how aerobic capacity is affected by varying exercise levels.

Despite the well-established advantages of physical activity, little is known about how it affects countries in the Persian Gulf. Concerns over the fitness levels of Kuwaiti students with ID, who often take fewer than 5,000 steps per day, are raised by studies such as Abbas et al. (2018). The relationship between aerobic capacity, muscle strength, and physical activity in this population requires more investigation.

Due to issues including low motivation (Halle, Gabler-Halle, & Chung, 1999) and poor motor coordination (Hartmam et al., 2010), children with ID have a difficult time participating in regular physical activity. It is unknown, therefore, how much these restrictions affect aerobic capacity and muscle strength. Developing successful interventions to improve the physical fitness and general wellbeing of children with ID requires a deeper comprehension of these linkages.

By examining the effects of physical activity on lower limb muscle strength and aerobic capacity in school-aged children with ID, this study aims to close this gap. This study uses accelerometers, which provide more reliable physical activity measurements than earlier research that relied on self-reports or less accurate tracking technologies. The results of this research will help develop evidence-based fitness regimens designed to enhance children with ID's mobility, independence, and quality of life.

Based on a comprehensive review of prior research (Rimmer et al., 2004; Hartman et al., 2010; Sit et al., 2007; Frey, 2008; Fernhall et al., 1998; Halle, Gabler-Halle, & Chung, 1999; Pitetti et al., 2001; Shields et al., 2013; and Wu et al., 2017), the study hypothesizes that higher physical activity levels are significantly associated with greater lower limb muscle strength and improved aerobic capacity in school-aged children with intellectual disability.

METHODS

Research Design and Participants

The study is a descriptive, non-experimental and cross-sectional research involving 15 female school students (12.4 ± 2.1 years) with mild to moderate intellectual disabilities, selected from the Intellectual Education School in Al-Khuwair and the Association for the Care of Disabled Children in Seeb, Oman. Participants were chosen purposively in coordination with the school and association administrators after reviewing their clinical records and IQ tests. The minimum sample size required to participate in this study was calculated using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007), which is a stand-alone power analysis program for many statistical tests commonly used in the social, behavioral, and biomedical sciences. The analysis revealed that a total sample size of N = 19 would be sufficient to find objective results regarding the correlation between the study variables ($r = 0.71$, $\alpha = 0.05$) with a test power of 0.80. The total participants in the current study were (20) students with ID, eight students from the School of Intellectual Education, and seven others from the 'Association for the Care of Disabled Children'. Five students were excluded due to lack of complete measurements, making the final sample size of the study (15) students. The inclusion criteria required students to have mild or moderate intellectual disabilities diagnosed using the Wechsler Intelligence Scale for Children-III (WISC-III) (Ramírez & Rosas, 2007) and an IQ range of 50-70 assessed by the Binet Intelligence Scale (Goddard, 1914). The Wechsler scales include both a verbal and a nonverbal domain, while the Leiter-R is a non-verbal test. The test procedure also includes a general assessment of the child´s well-being, mood and ability to cooperate in the test. Moreover, any specific impairment that could negatively affect the child´s ability to cooperate, motor impairment, visual or hearing impairments or specific behavioral problems needs also to be considered (Lindblad, 2013). However, Exclusion criteria included motor disabilities, wheelchair dependence, or chronic diseases.

Parental consent was obtained after explaining the study's purpose and procedures. Ethical approval was obtained from the Intellectual Education School in Al-Khuwair and the Association for the Care of Disabled Children in Seeb. The research protocol was recognized in the Declaration of Helsinki (World Medical Association, 2013) and approved by the Ethical Committee of Deanship of Higher Studies and Scientific Research at the Sultan Qaboos University under the number of IG/EDU/CUTM/2020/01 -SQU.

Procedures

Once approvals were secured, the researchers conducted surveys and field visits to ensure the study could be implemented effectively. During the survey visit, they coordinated with the school administrators and teachers to set dates and outline the study's implementation procedures. They also discussed potential challenges with teachers, gaining insights on how to work with students with intellectual disabilities. The locations for testing were determined, with indoor sports halls chosen for most tests, except the 6-minute walk test, which required a larger space.

Prior to starting the study, researchers made sure the students understood the assessments and felt at ease utilizing the necessary tools, like the motor accelerometer. Physical therapists who work with people who have ID examined and discussed all of the assessments in a focus group. The research was conducted across several trips between March 2, 2022, and April 13, 2022. Body height (BH), lower limb length (LLL), body mass (BM), and body mass index (BMI) were among the anthropometric measurements that were taken at the initial visit. Lower limb strength tests (CMJ, FCMJ) were conducted on the second visit. The 6-minute walk test (6MWT) was performed on the third visit.

Instruments and Testing

Aerobic capacity and cardiovascular fitness: (6-minute walk test)

The six-minute walk test (6MWT) is a commonly used sub-maximal exercise test for measuring physical functional capacity (Du et al.,2009). It is a reliable, inexpensive, and safe method, particularly suitable for individuals with mental disabilities with a high reliability coefficient (ICC = 0.94) (Li et al., 2007). Participants in the test must walk as far as they can down a 30-meter corridor that is marked with cones every two meters. Without any encouragement or intervention from researchers, they walk back and forth for six minutes, and the distance they cover recorded.

Physical Activity

Over the course of three school days, the study measured the physical activity of students with a mental disability using a motor accelerometer (ActiGraph GT3X). Wearable on the right side of the waist, the gadget is 1.8 x 3.7 x 3.8 cm and weighs 27 grammes. It tracks movement in three axes: vertical, medial, and anterior-posterior. It can store up to 1 MB of data and detect acceleration between 2.0 and 0.05 g (Trost, 2001). Data was recorded in 15-second epochs and gathered between 8:00 am and 12:00 pm when schools were in session. ActiGraph software Tool v3.00 was used to analyze the data (Neishabouri et al., 2022).

Lower Limb Muscular Strength

The (CMJ - FCMJ) tests evaluate maximal jump height, reflecting leg-muscle strength, power and coordination (Blomqvist et al., 2013). This test aimed to assess lower limb muscular strength using two modes of countermovement jumps: (Countermovement Jump- CMJ, and Free Countermovement jump- FCMJ). For this purpose, the Optojump Next device (Microgate, Italy), known for its high test-retest reliability ICC = 0.987 (Cameron et al., 2024), was used to measure flight time (FT) during the jumps. The FT is recorded as beams are broken when the athlete leaves and lands on the ground, allowing the calculation of jump height (JH) (Comyns et al., 2023).

The testing protocol involved the subjects standing on a force platform with Optojump positioned to synchronize the measurements for each jump. For CMJ, participants performed a vertical jump from a bipedal position with hands on hips, flexing their knees to 90°. For FCMJ, they performed a CMJ with an arm swing. The recommended take-off technique was for participants to leave the ground with their toes. Incorrect jumps were discarded, and three attempts were made (Hernández et al., 2023). Before testing, the evaluator demonstrated the procedure, allowing two familiarization attempts. Each subject then performed three test trials, and the best average height reached was recorded.

Data Analysis

Data analysis was performed using the SPSS 26.0 statistical software. A significance level of p 0.05 was considered statistically significant. Descriptive statistics like the arithmetic mean, and the standard deviation values of the assessed variables were calculated. The Kolmogorov-Smirnov test was used to verify the normality of data distribution in all measurements. Pearson correlation coefficients were calculated to describe the relationship between the variables of physical activity (average minutes/day), lower limb muscle strength (averages of CMJ and FCMJ), and aerobic capacity (average of 6MWT) in children with intellectual disabilities.

RESULTS

Descriptive Statistics

Anthropometric measurements, muscular strength, and aerobic capacity

The descriptive statistics shown in Table 1 included the averages, standard deviations, and normality distributions of

Table 1. Means, standard deviations, and distribution of age, body metrics, strength, and aerobic capacity (n=15)

Variable	Mean+SD	KST
Age (years)	12.4±2.1	0.469
BH (cm)	135±13.0	0.947
LLL (cm)	66±7.0	0.615
BM (kg)	34.8±14.5	0.253
BMI (BM/BH^2)	18.3±4.8	0.921
CMJ (cm)	5.5±10.6	0.884
FCMJ (cm)	6.7±12.5	0.789
6MWT (meters)	72.3±400.7	0.973

BH: Body Height, LLL: Length of Lower Limbs,
CMJ: Countermovement jump, FCMJ: Free countermovement jump,
6MWT: 6 minutes' walk test, KST: Kolmogorov Smirnov Test.

the scores of the tested variables representing the anthropometric measurements (BH, BM, BMI, and LLL), the lower limb muscular strength, (CMJ and FCMJ), and the aerobic capacity (6MWT) of the study sample.

Physical Activity Levels

According to the results, the level of inactivity or sedentary behavior (SB) scoring (465.15 ± 53.5), or 8 hours, 45 minutes per day, had the highest average. Conversely, the level of intense exercise experienced the lowest average (26.7 ± 9.7 minutes). Additionally, during the three days of official attendance, the combined level of moderate and vigorous physical activity reached 65.9 ± 15.3, or roughly 22 minutes each day, according to the data. Table 2 displays these findings.

Inferential Statistics

Relationships between physical activity, lower limb muscular strength, and aerobic capacity

The Pearson Correlation Coefficient test showed significant relationships between physical activity and both variables (lower limb muscular strength and aerobic capacity), as shown in Table 3. Since the coefficient of these correlations ranged between 4 and 7 (r=0.41 – r=0.699), a significant relationship between physical activity and lower limb muscular strength is presented by the positive moderate correlation between both CMJ and FCMJ tests and the LPA, MPA, and VPA levels. Nonetheless, there was a positive and significant connection (r=0.734–0.761) between CMJ, FCMJ, and combined PA (VPA/MPA), suggesting that physical activity improves lower limb muscle strength in female students with ID. Furthermore, a moderately negative connection has been found between CMJ, FCMJ, and SB (r=-0.559, r=-0.609), respectively, suggesting that sedentary behavior severely reduces lower limb muscle strength in this population.

However, as shown in Figures 1 and 2, respectively, the Pearson Correlation test revealed a substantial positive correlation between 1) combined physical activity and the 6-minute walk test (r=0.79) and 2) vigorous physical activity and the 6-minute walk test (r=0.82). These strong positive correlations show that aerobic capacity performance would increase with the duration of daily intense or mixed physical activity.

Table 2. Means, standard deviations, and distribution of physical activity over 3 school days (n=15)

Activity Level	Mean+SD	KST
SB (min)	53.5±465.1	0.980
LPA (min)	45.6±186	0.949
MPA (min)	9.9±39.2	0.992
VPA (min)	9.7±26.7	0.316
Combined PA (min)	15.3±65.9	0.393

SB: Sedentary Behavior, LPA: Light Physical Activity,
MPA: Moderate Physical Activity, VPA: Vigorous Physical Activity,
Combined PA (VPA- MPA), and KST: Kolmogorov Smirnov Test

Table 3. Relationship between 3-day school activity, lower-limb strength, and aerobic capacity (n=15)

		SB	LPA	MPA	VPA	Combined PA
1	CMJ	r=-0.559	r=0.411	r=0.411	r=0.699	r=0.734
2	FCMJ	r=-0.609	r=0.475	r=0.449	r=0.666	r=0.761

SB: Sedentary Behavior, LPA: Light Physical Activity,
MPA: Moderate Physical Activity, VPA: Vigorous Physical Activity,
Combined PA (VPA- MPA), CMJ: Countermovement jump,
FCMJ: Free countermovement jump

DISCUSSION

This study aims to evaluate physical activity levels and determine their relationship with lower limb muscle strength and aerobic capacity in school students with intellectual disability.

Sedentary behavior (SB), which averaged 465.15 ± 53.5 minutes per day (about 8 hours and 45 minutes), was the most common activity level among individuals, according to the study. According to earlier studies, children with intellectual disabilities (ID) have high SB levels. These findings are probably caused by a variety of factors, including delayed motor and cognitive development, low motivation, low muscular strength, reduced cardiorespiratory fitness, limited structured exercise programs, and environmental barriers (Pitetti et al., 2009; Rimmer et al., 2004; Shields, Synnot, and Barr., 2012). Long-term inactivity can impair muscle strength, raise the risk of obesity, and have a detrimental effect on cardiovascular fitness (Sit et al., 2007).

In contrast, just 26.7 ± 9.7 minutes a day on average were spent in vigorous physical activity (VPA). Over the course of three school days, the average combined moderate and vigorous physical activity (MVPA) was 65.9 ± 15.3 minutes or roughly 22 minutes per day. This is less than the 60 minutes of MVPA per day that the World Health Organization (WHO, 2020) recommends. These activity levels were higher than the 15 minutes noted by Kozub (2003) but lower than those reported by Pitetti et al. (2009) (83 minutes per day)

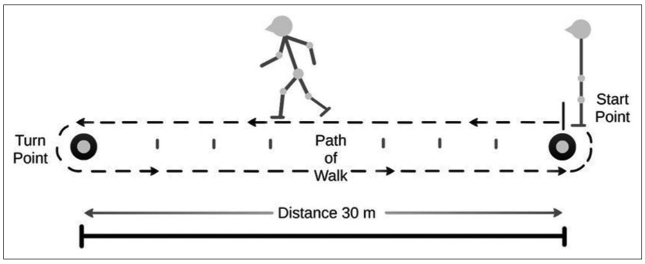

Figure 1. The 6-minute walk test Track

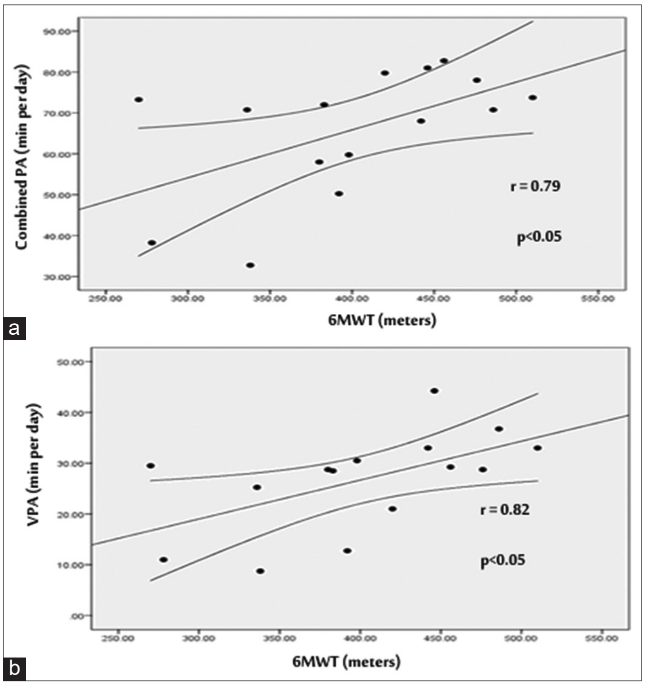

Figure 2. a) Relation between combined physical activity and the 6-minute walk test. b) Relation between vigorous physical activity and the 6-minute walk test

and Lin et al. (2010) (30 minutes per day) in comparison to earlier studies. Furthermore, the degree of ID, gender, and age all affect motor skill performance; children with moderate ID have lower locomotor ability than those with borderline ID (Hartman et al., 2010). These results highlight the necessity of focused treatments to support children with ID in leading more active lives.

Students' average jump heights in the CMJ and FCMJ tests were 10.6 cm and 12.5 cm, respectively. These findings were greater than the 8.6 cm CMJ score discovered in a study by Hernández et al. (2023) with a comparable sample, but lower than the 19.0 cm CMJ average published by Blomqvist et al. (2013). According to Hassani et al. (2013) and Blomqvist et al. (2013), people without intellectual disabilities (ID) outperformed those with ID in terms of jump height. While Alhadabi et al. (2024) reported CMJ and FCMJ averages of 22.8 cm and 27.6 cm, respectively, in normal schoolchildren, Temfemo et al. (2009) observed that 12 to 13-year-old females without ID had CMJ averages ranging from 22.9 ± 1.8 cm to 26.6 ± 2.5 cm. People with ID perform worse on CMJ, consistent with other research showing poorer scores on squat and standing long jumps (Hassani et al., 2013; Skowronski et al., 2009). Increased inactivity, deficiencies of the motor system stiffness, poor joint mechanics, immature technique, and inadequate neuromuscular activation are likely the causes of these shortcomings (Yu et al., 2008; Hassani et al., 2013).

The average distance travelled by students with ID throughout the 6-minute walk test (6MWT) was 400.7 ± 72.3 meters. This result is higher than the (331±63) meters reported by Wouters et al. (2017) but remains lower compared to earlier studies (Steffen et al., 2002; Trooster et al., 1999; Enright & Sherrill, 1998; Gibbons et al., 2001). The poorer performance is probably caused by sedentary behavior and a lack of physical activity, which impairs children with ID's resilience, flexibility, balance, and endurance (Golubović et al., 2012). Furthermore, as motivation has been demonstrated to improve performance in walking tests, the shorter distances may have resulted from a lack of encouragement during the test (Crapo et al., 2002).

The CMJ and FCMJ tests revealed a substantial positive relationship between lower limb muscular strength and physical activity levels (LPA, MPA, and VPA) in female students with mild to moderate ID. These results are in line with a study by Tsimaras and Fotiadou (2004) that showed enhanced muscle strength and motor function in children with ID who participated in structured physical exercise programs. Lower limb strength and moderate-to-vigorous physical activity (MVPA) showed the greatest correlation (r = 0.734–0.761), confirming the importance of weight-bearing exercises and progressive resistance in neuromuscular adaptation (Rimmer et al., 2004).

Additionally, prior research shows that children with ID benefit from regular physical activity in terms of improved motor skills, muscle function, and general physical performance (Hartman et al., 2010; Hassani et al., 2014; Hartman et al., 2015). It has also been demonstrated that children with developmental disabilities benefit from strength-based exercises like running and leaping in terms of their coordination and functional movement patterns (Verschuren et al., 2016).

On the other hand, the study found a negative association between lower limb muscle strength and sedentary behavior (SB) (r = -0.559, r = -0.609), underscoring the deleterious consequences of inactivity. Long-term inactivity has been linked to decreased motor function and muscular atrophy in kids with ID (Sit et al., 2007). According to research, kids with ID tend to be more inactive than their classmates who are usually developing (Frey, 2008). According to Shields, Synnot, and Barr (2012), extended periods of inactivity raise the risk of obesity and cardiovascular illnesses by reducing muscle mass and impairing physical function. These results highlight the value of programs designed to increase physical engagement and decrease sedentary time in order to improve lower limb muscle strength in kids with ID.

Using the 6-minute walk test (6MWT), the study discovered high positive correlations between aerobic capacity and physical activity, with intense physical activity showing a correlation of r = 0.82 and mixed physical activity showing a significant correlation of r = 0.79. This suggests that aerobic capacity is considerably increased by increased physical activity involvement. These results are consistent with the study by Fernhall et al. (1998), which showed that children with intellectual disabilities (ID) benefit from structured aerobic training in terms of improved cardiovascular efficiency and endurance. Similarly, a significant relationship (r = 0.890) between aerobic capacity and strenuous physical exercise was reported by Halle, Gabler-Halle, and Chung (1999).

The study supports the notion that physical activity duration and intensity are important factors in the development of aerobic capacity. In line with other research that suggests higher-intensity exercise is required to activate physiological adaptations in children with ID, vigorous activity seems to be especially effective in improving endurance (Pitetti et al., 2001). The results also corroborate research by Wu et al. (2017), who noted the advantages of an 8-week walking program, and Shields et al. (2013), who connected daily step count to enhanced 6MWT performance. Furthermore, Wouters et al. (2019) discovered a link between autistic children's vertical jump performance and the number of daily steps they take. The findings, however, are in contrast to those of Pitetti et al. (2009), who did not discover any meaningful connection between daily steps and 6MWT performance. The functional demands on the respiratory and circulatory systems are probably the reason for the association between 6MWT performance and moderate-to-high intensity exercise (Elmahgoub et al., 2011).

Overall, the study highlights the strong relationships between physical activity, lower limb muscle strength, and aerobic capacity in school students with ID. Based on these findings, the research hypothesis that higher physical activity levels are significantly associated with greater lower limb muscle strength and improved aerobic capacity in school-aged children with intellectual disability was confirmed and accepted.

The study admits a number of limitations, such as a limited sample size, an imbalance in gender, and difficulties in regulating outside variables that could affect exercise results, such as motivation, program interest, and health status. Furthermore, the study's conclusions don't shed light on kids with severe or profound intellectual disability (ID) because it only looked at individuals with mild to moderate ID. The study's generalizability to other groups is hampered by its demographic and geographic limitations, which include only people with IQs between 50 and 70 and its restriction to one private school and one private association in the Sultanate of Oman. Additionally, only school days were used to quantify physical activity and inactivity; weekend activity was not included, which might have affected the findings.

Finally, teachers, therapists, and legislators who work with children who have ID should take note of these study findings. Since aerobic capacity, muscular strength, and physical activity are strongly correlated, adding regular physical activity programs to school curricula may significantly impact students' health. Future studies should look into how different types and intensities of exercise affect children with ID's functional outcomes over the long run. Furthermore, long-term research examining these associations' underlying causes would offer a more profound understanding of how to best design physical activity regimens for this demographic.

CONCLUSION

With high levels of inactive time and very low levels of moderate to vigorous physical activity (MVPA), the results show a worrying level of inactivity among the participants. Muscular strength is adversely correlated with inactivity, as seen by the notable decline in strength that occurs with sedentary behavior. Conversely, it has been demonstrated that light, moderate, and vigorous physical activity can enhance lower limb muscle strength, with vigorous activity producing the greatest benefits. Furthermore, the study discovered a substantial link between increased aerobic capacity and extended periods of vigorous physical activity, indicating that persistent activity can greatly improve the general physical health of school students with intellectual disabilities.

Designing and implementing focused physical activity programs that promote regular exercise and lessen sedentary behavior in kids with mild to moderate intellectual disabilities is essential in light of these findings. For a more thorough knowledge of the patterns of physical activity and their long-term effects on these children's health, future studies should concentrate on bigger, more varied samples and investigate activity levels throughout weekends.

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DATA AVAILABILITY

All authors declare that the data in this study are accessible from the corresponding author upon reasonable request.

AUTHORS' CONTRIBUTION

Author Heba El-Ashkar contributed to the conceptual design of the study. Authors Badriya Al-Hadabi and Fadi Fayad collected the data, performed the statistical analysis. All authors contributed in interpreting the results. Badriya Al-Hadabi wrote the first draft. Heba El-Ashkar wrote the second draft, and Fadi Fayad proofread and approved the final version to be published.

ETHICAL APPROVAL

This study has been approved by the Ethical Committee of Deanship of Higher Studies and Scientific Research at the Sultan Qaboos University under the number of IG/EDU/CUTM/2020/01 -SQU.

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