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The Influence of Physical Activity Regime on Body Composition among Adolescents with and without Intellectual Disabilities

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Abstract: *This study aims to assess several morphofunctional parameters in female teenagers with and without intellectual disability to characterise normality and its disturbances. More precisely, the purpose was to examine the factors contributing to the differences in body composition elements between groups, such as the physical activity level. To evaluate these parameters, we used bioelectrical impedance analysis technology (BIA), most commonly used in studies concerning body composition because it is non-invasive, quick, with high data fidelity; it can be easily moved to various locations and applied straightforwardly among populations with diverse types of intellectual disability. Our research sample comprised 212 subjects (boys and girls) aged 17.1±0.6, divided into six groups by gender and type of intellectual disability. The study found influences of physical activity level on body composition components. In addition, we report a highly significant relationship for p<0.05, body mass index and the independent variable (No. of min./week) in some groups.*

Keywords: *body composition; physical activity; intellectual disability.*

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1. Introduction

According to WHO, physical activity is "any bodily movement produced by skeletal muscles that requires energy expenditure. Physical activity refers to all movement, including during leisure time, for transport to and from places, or as part of a person's work"(World Health Organization). Physical activity can include various physical activities, such as planned physical effort (participation in Physical Education classes and sports practices), play, indoor/outdoor chores, leisure fitness, and walking (Kaplsal, 2019).

From the perspective of World Health Organisation, intellectual disability is a significant impairment in various development fields, such as general cognitive function, social skills, and adaptive behaviour. The notion of "intellectual disability" refers to a group of development conditions impairing a person's cognitive functioning and, thus, their capacity to learn and function independently (Akhtar & McGibbon, 2022). According to the American Association on Intellectual and Developmental Disabilities (AAIDD), intellectual disability is a "condition characterised by significant limitations in both intellectual functioning and adaptive behaviour" (American Association on Intellectual and Developmental Disabilities, 2023). The lack of complete intellectual development comprises the impairment of all functions contributing to an individual's intelligence, such as cognitive, language, motor, and socialisation functions (World Health Organization). Intellectual disability is present when an individual has significant limitations in intellectual function and adaptive behaviour, including various language, motor, social, as well as practical skills (Totsika et al., 2022). Concomitantly, the notion of intellectual disability involves the essential decrease in mental capabilities, determining many disturbances in an individual's reactions and mechanisms of adaptation to the volatile conditions of the environment and social cohabitation rules within a specific cultural area, which places an individual in a state of incapacity and inferiority, expressed by a state of handicap concerning the other members of the community to which they belong (Shree & Shukla, 2016).

The motor activity of teenagers with intellectual disabilities represents one of their particularities, deriving from the maturation state of the nervous system and their physical development degree. The potential disturbances at the level of psychomotricity are all the more conspicuous as the degree of deficiency is more severe. Children and teenagers are involved in an insufficient number of physical activity types (PA) and are more likely to embrace sedentary behaviours (Tsalis & Kyriakidou, 2023). Given that teenagers and children with intellectual disabilities engage in less physical activity than their peers unaffected by intellectual disabilities, we record serious motivation to encourage physical activities among the population. Thus far, in Romania, few studies have been carried out regarding the effects of physical activities on children and teenagers with intellectual disabilities. In other countries, research has shown that the measures taken for this population or specific groups of subjects were implemented upon examining a series of distinct results, even the subjects' aggressive behaviour (Baird et al., 2023), motor performance, balance, physical activity, dietary habits, and general health (Gil-Llario et al., 2023).

Up to this day, just a few studies have investigated physical activity involving children and teenagers and the opportunities available to them in school (e.g., participating in games, interactive programs) and outside it (i.e., active commute – walking from home to school and vice versa, participating in practices within clubs after school). Furthermore, whereas scientists are aware of the low levels of physical activity engaging children and teenagers with intellectual disabilities (Wang et al., 2022), it is hard for researchers to determine the time and methods for this population to exercise due to the limited number of studies. The school environment, the Physical Education classes, and the periods for play provide a substantial amount of time for children and teenagers to engage in physical activities (Maiano & Hue, 2019). Besides the contributions to the general levels of physical activity, the previous research of the regular population demonstrates positive associations between play time and active behaviour in Physical Education classes (Bertapelli et al., 2016).

Young people with intellectual disabilities attend fewer physical activities than the same-aged population in general. Because of inactivity, youths with intellectual disabilities are less prone to be physically fit compared to their peers without intellectual disabilities (Rimmer et al., 2010). Long periods of physical inactivity in this population could be an additional sign that several factors prevent the youths from engaging in physical activities. It may come down to an ensemble of personal factors (physical and cognitive) and significant environmental factors (due to no opportunities to practise sports or be physically active (Sallis et al., 2015). This interaction recorded between factors entails a lack of opportunities for young people with intellectual disabilities, restricting their physical activity or practice of a sport, given their dependence on others (such as parents, caretakers, teachers) compared to developing youths.

Recent studies (Farías-Valenzuela et al., 2022) have shown that exercising can improve general health, muscle development, cardiorespiratory health, and cognitive and mental performance. Numerous studies argue that physical activity brings benefits to persons with intellectual disability. A systematic review conducted in 2018 by Crespillo-Jurado examined the effects of physical exercises on health and quality of life in persons with intellectual disabilities. The study reports that physical exercises can improve these patients' general health, motor development, and quality of life (Crespillo-Jurado et al., 2018). Another research carried out in 2023 by Lancioni et al. analysed the effects of long-term physical exercise programs on health and motor skills in youths with an intellectual disability. They concluded that physical exercise programs significantly improved balance, muscle strength, and agility (Lancioni et al., 2023). A different study focused on the effects of a workout routine on functional capacity and the quality of life in teenagers with an intellectual disability. Per the research, the workout routine improved physical effort resistance and quality of life (Rintala et al., 2019). An investigation conducted in 2020 examined the effects of a workout routine on motor skills and self-esteem in teenagers with an intellectual disability. According to the study, physical exercise programs significantly improved motor skills and self-esteem among the participants (Oviedo et al., 2020).

Physical activity correlates positively with cardiorespiratory and muscular fitness; both are essential components of general health; on the contrary, physical idleness is the fourth most crucial factor entailing early death at a global level. Physical idleness is also a crucial risk factor concerning obesity and other life-threatening conditions like cardiovascular disease, cancer, even diabetes (O'Donovan et al., 2017). Comprehensive research has been carried out on the benefits, on a body level, of physical activity among adolescents with an intellectual disability. The research suggests that physical activity in and outside school has a positive influence on teenagers' physical, psychological, and social evolution. More precisely, it has been proven that physical activity enhances the quality of life (Poitras et al., 2016), decrease the risk of disease, increase mental and emotional well-being (Ferrero-Hernández et al., 2023; Owen et al., 2016; Zaragas et al., 2023), improve school performance and motor skills (Aksovic et al., 2023), increase the frequency of prosocial behaviours (Sakalidis et al., 2023) and improve self-concept (van Tuyll van Serooskerken et al., 2022).

2. Materials and Methods

This investigation presented here began a while ago, with conversations involving Physical Education and Sports teachers within inclusive education centres, school children suffering from an intellectual disability, discussions with experts in the field, and the literature study. The activities took place in the gymnasiums of educational establishments and the physical therapy practices pertaining to the "Sf. Andrei" School Centre Gura Humorului (Suceava County), The "Constantin Păunescu" School Centre Iaşi, "Elisabeta Polihroniade" Inclusive Education School Centre Vaslui, "Emil Gârleanu" Special School No. 1 Galaţi. Our investigation comprised 212 subjects from the State institutions listed above, distributed in six groups, depending on gender and type of disability (see Table 1).

Table 1. Subject repartition by age, cases, and educational institutions

Subjects	**Gender**	**N**	**Age (mean±std.dev.)**	**Case observation**
Group 1(WID) Without intellectual disabilities	M	44	17.7±0.9	WID
Group 2 (WID) Without intellectual disabilities (WID)	F	55	17.2±0.7	WID
Group 3 (MID) Moderate intellectual disability	M	57	17.05±0.7	MID
Group 4 (MID) Moderate intellectual disability	F	22	16.6±0.8	MID
Group 5 (SID) Severe intellectual disability	M	23	17.4±0.8	SID
Group 6 (SID) Severe intellectual disability	F	11	17.1±0.8	SID

Source: Author`s Work

We used the TANITA MC 580 professional device to determine the body composition and a dedicated analysis software, i.e., TANITA PRO SOFTWARE – 3.4.5 version – the Tanita PRO software pack was created in collaboration with the most significant software developer in the medical field (Medizin & Service GmbH). The software can store and assess the data from the Tanita MC 580 monitor. According to EU Regulations, both the device for body composition and the software are medically approved, and they observe the current Regulations (Council Directive 93/42/EEC, dated to 14 June 1993 regarding medical tools).

The TANITA multi-frequency monitors assess bioelectrical impedance analysis starting from three or six frequencies. The other frequencies entail exceptional precision, unlike one-frequency and dual-frequency monitors. Lower frequencies are the ones that assess the external impedance of the cellular membrane. Higher frequencies can enter the cellular membrane, measuring impedance at a low level and higher frequencies, hence showing extracellular and intracellular water and total body water. Such data are essential to provide various notions about a person's health, thus indicating potential risks related to physical health.

The use of TANITA MC580 and TANITA PRO SOFTWARE shows the following measurements: Body mass – Kg; BMI (kg/h2); Body fat %; Lean or muscular mass %; BMR (kcal); Body fat – Kg; Muscle mass – Kg; SMM – skeletal muscle mass; we also assessed bone mineral mass; Segmental analysis cocerning upper/lower limbs, left/right, which, besides height (determined using the telemeter) represent the dependent variables. Height is the variable to be introduced manually in the Tanita PRO software to determine the body mass index. To assess a subject's height accurately, he stands barefoot, touching a vertical wall with his back, head, and heels; the head faces forward. With a telemeter, we measure the distance as shown from the floor to the perpendicular projection of the so-called vertex point (the highest cranial point) on the wall, established using an object with a 90-degree angle (e.g., a protractor), with one side on the vertex and the other. It is noted in centimetres and subdivisions of 0.5 cm. Within the measures taken on this group of subjects, we used a Bosch GLM 80 laser telemeter to obtain a precise measurement.

The independent variables are gender, type of intellectual disability, and number of minutes of physical activity/week.

We analysed the data collected using numerical syntheses in SPSS 20.0., thus removing some of the data to increase relevance. Statistical analyses used: One-way ANOVA is a statistical method used to compare the average value of measurements to assess whether they are significantly different, using one independent variable. There is a type of variance analysis typically used to examine sets of data. Generally, it compares three or more groups of data using two-way ANOVA; Post hoc Fisher LSD analysis to point out accurately the correlations between the groups of subjects; The Bonferroni procedure (Bonferroni Correction). This post-hoc correction with multiple comparisons is used when carrying out several independent or dependent statistical tests concomitantly; Simple linear regression is a statistical analysis technique exploring the relationship between a dependent variable and one independent variable (or predictor). This analysis can be used to determine the variation of the dependent variable by the modifications of the independent variable. Specifically, simple linear regression focuses on finding a linear relationship between the dependent and the independent variable.

Ethics: This study was conducted per the 1964 Declaration of Helsinki.

Hypothesis. Physical activity among teenagers with an intellectual disability can influence the body composition parameters.

3. Results

We used simple linear regression to assess the effect of physical activity (No. of min./week) on body composition parameters. Following this analysis, we identified just one interaction in the group of boys, between physical activity (No. of min./week) and skeletal muscle mass, for $p<0.05$ (Table 2); it can be considered that the independent variable (No. of min./week) influences skeletal muscle mass.

Table 2. Linear regression for SMM in the group of boys WID (ANOVA[a]).

Model		Sum of squares	df	Mean squares	F	Sign. thresh.
1	Regression	156.055	1	156.055	4.817	.030[b]
	Residual value	3952.040	122	32.394		
	Total	4108.095	123			

a. Dependent variable: SMM; b. Prediction: (Constant), No. of min./week; F-approximation used to calculate significance; df-degree of freedom for Fisher distribution.

Source: Author`s Work

Thus, the value of (adjusted) regression coefficient $R^2 = 0.038$ (Table 3) represents the variation percentage, i.e., 3.8% in the dependent variable of skeletal muscle mass (SMM). This percentage can be explained by the independent variable (No. of min./week).

Table 3. The regression coefficient for the group of boys WID (Anova[b]).

Model	R	R2	R2 adjusted	Estimated standard error
1	.195a	.038	.030	5.6916

a. Prediction: (Constant), No. of min./week; b-dependent variable; R- regression coefficient; R2 – regression coefficient squared

Source: Author`s Work

We did not identify any statistically significant interactions for the two other groups of boys with MID and SID. However, we used a One-Way ANOVA test to determine the effect of physical activity on specific components of body composition. In this respect, to determine the relationship between the dependent variables and the independent variable (weekly physical activity), we identified four levels of physical activity/week in agreement with the activities conducted by the subjects during Physical Education classes, sports circle classes, or other extracurricular sports activities. Hence, we pointed out the following levels of physical activity:

AL 1 - Activity level 1 - physical activity < 90 min.

AL 2 - Activity level 2 - physical activity ranging between 90 – 135 min.

AL 3 - Activity level 3 - physical activity ranging between 135 – 240 min.

AL 4 - Activity level 4 - physical activity >240 min.

Table 4. The ANOVA test for the dependent variables concerning the male groups

		Sum of squares	df	Mean squares	F	Sign. Thresh. (p)
Height - cm	Between groups	830.194	3	276.731	3.524	***.017***
	Within the groups	9424.041	120	78.534		
	Total	10254.234	123			
Body mass-Kg	Between groups	1403.089	3	467.696	2.172	.095
	Within the groups	25839.632	120	215.330		
	Total	27242.721	123			
BMI (kg/m2)	Between groups	33.594	3	11.198	.561	.642
	Within the groups	2396.306	120	19.969		
	Total	2429.900	123			
Body fat %	Between groups	60.423	3	20.141	.306	.821
	Within the groups	7904.260	120	65.869		
	Total	7964.683	123			
Muscle mass %	Between groups	17.109	3	5.703	.178	.911
	Within the groups	3834.498	120	31.954		
	Total	3851.607	123			
BMR (kcal)	Between groups	438542.076	3	146180.692	2.307	.080

	Within the groups	7603922.916	120	63366.024		
	Total	8042464.992	123			
Body fat-Kg	Between groups	40.084	3	13.361	.203	.894
	Within the groups	7885.495	120	65.712		
	Total	7925.580	123			
Muscle mass-kg	Between groups	964.858	3	321.619	4.175	***.008**
	Within the groups	9244.679	120	77.039		
	Total	10209.538	123			
SMM	Between groups	503.634	3	167.878	5.589	***.001**
	Within the groups	3604.461	120	30.037		
	Total	4108.095	123			

df-degree of freedom for Fisher distribution; F-approximation used to calculate significance; *Significance threshold for $p<0.05$.

Source: Author`s Work.

As shown in Table 4, the weekly physical activity level generates significant differences for variables such as height, muscle mass (kg), and skeletal muscle mass. The multiple comparison (Bonferroni) between the activity levels highlights significant differences between AL 2 (PA - 90-135 min) and AL 4 (PA > 240 min) for skeletal muscle mass (Kg) $p<0.05$ (Table 5) with a difference between means of 6.08 kg skeletal muscle mass and between AL 1 (PA < 90 min.) and AL 4 (PA > 240 min), for the same dependent variable $p<0.05$ (Table 3.21), the difference between means with a value of 4.51 kg. Another significant difference was noted in muscle mass in kg for $p<0.05$ (Table 5) between AL 2 and AL 4 (the difference between means amounts to 9.00 kg).

Table 5. Significance threshold and the difference between means for the group of boys WID.

Dependent variable	(I) Phys. act. lev.	(J) Phys. act. lev.	The difference between means(I-J)	Er. Std.	Sig.	95% Confidence interval	
						Lower limit	Upper limit
Muscle mass-Kg	1.00	2.00	3.0655	1.9699	.734	-2.219	8.350
		3.00	-4.7827	4.5041	1.000	-16.866	7.300
		4.00	-5.9382	2.3037	.067	-12.118	.242
	2.00	1.00	-3.0655	1.9699	.734	-8.350	2.219
		3.00	-7.8481	4.7025	.586	-20.463	4.767
		4.00	***-9.0037****	2.6708	***.006***	-16.169	-1.839
	3.00	1.00	4.7827	4.5041	1.000	-7.300	16.866
		2.00	7.8481	4.7025	.586	-4.767	20.463
		4.00	-1.1556	4.8518	1.000	-14.171	11.860
	4.00	1.00	5.9382	2.3037	.067	-.242	12.118
		2.00	***9.0037****	2.6708	***.006***	1.839	16.169
		3.00	1.1556	4.8518	1.000	-11.860	14.171
SMM	1.00	2.00	1.5690	1.2300	1.000	-1.731	4.869
		3.00	-4.9532	2.8124	.485	-12.498	2.592
		4.00	***-4.5143****	1.4385	***.013***	-8.373	-.655
	2.00	1.00	-1.5690	1.2300	1.000	-4.869	1.731
		3.00	-6.5222	2.9363	.169	-14.399	1.355
		4.00	***-6.0833****	1.6677	***.002***	-10.557	-1.609
	3.00	1.00	4.9532	2.8124	.485	-2.592	12.498
		2.00	6.5222	2.9363	.169	-1.355	14.399
		4.00	.4389	3.0295	1.000	-7.688	8.566
	4.00	1.00	***4.5143****	1.4385	***.013***	.655	8.373
		2.00	***6.0833****	1.6677	***.002***	1.609	10.557
		3.00	-.4389	3.0295	1.000	-8.566	7.688

Source: Author`s Work. The difference between means is significant for the threshold $\alpha < 0.05$.

In the female groups, the most relevant effects of the independent variable No. of min./week on the dependent variables were identified in the group with moderate intellectual disability, as follows:

Skeletal muscle mass (SMM) can be influenced by up to 18.5% by the number of minutes of physical activity (Table 6), for $p<0.05$ (Table 7)

Table 6. The regression coefficient (SMM) for the group of girls with MID

Model	**R**	**R^2**	**R^2 adjusted**	**Estimated standard error**
1	.431a	.185	.145	2.9579

Source: Author`s Work. a. Prediction: (Constant), No. of min./week; b-dependent variable; R-the regression coefficient; R^2 – regression coefficient squared.

Table 7. Linear regression for SMM in the group of girls MID (ANOVA[a]).

Model		Sum of squares	df	Mean squares	F	Sign. thresh.
1	Regression	39.825	1	39.825	4.552	.045[b]
	Residual value	174.978	20	8.749		
	Total	214.804	21			

Source: Author`s Work. a. Dependent variable: SMM; b. Prediction: (Constant), No. of min./week; F-approximation used to calculate significance; df-degree of freedom for Fisher distribution.

Concerning body mass index, we note a highly significant relationship for $p<0.05$ between it and the independent variable (No. of min./week) (Table 8).

Table 8. Linear regression for BMI in the group of girls MID (ANOVA[a]).

Model		Sum of squares	df	Mean squares	F	Sign. thresh.
1	Regression	150.807	1	150.807	8.709	.008[b]
	Residual value	346.324	20	17.316		
	Total	497.131	21			

Source: Author`s Work. a. Dependent variable: BMI; b. Prediction: (Constant), No. of min./week; F-approximation used to calculate significance; df-degree of freedom for Fisher distribution.

As illustrated in Table 9, the value of the regression coefficient squared is 0.303, i.e., the body mass index value can be influenced by up to 30.3% by the No. of min./week. of physical activity.

Table 9. The regression coefficient (BMI) for the group of girls with MID.

Model	R	R^2	R^2 adjusted	Estimated standard error
1	.551[a]	.303	.269	4.1613

Source: Author`s Work. a. Prediction: (Constant), No. of min./week; b-dependent variable; R-the regression coefficient; R^2 – regression coefficient squared.

To determine the effect of the independent variable (physical activity - No. of min./week) on several components of body composition (dependent variables), like in the groups of boys, we used a One-Way ANOVA test for the entire group of girls concerning the four levels of physical activity, but no statistically significant differences were identified.

4. Discussion

Various research (Staśkiewicz et al., 2023; Cho et al., 2021) reports that the physical activity level influences muscle mass in boys. It is due to vigorous physical exercises increasing the synthesis of muscle proteins, which can increase muscle mass. Generally, these studies demonstrate that the physical activity level and the type of physical exercises performed by boys significantly impact muscle mass. Besides these studies, other research indicated that the physical activity level can have a crucial impact on muscle mass in boys. For instance, another investigation conducted by Yapici et al. (2022) shows that strength training in combination with a protein-rich diet can significantly increase the muscle mass of teenage boys (Nezondet et al., 2023).

Studies show that around 47% of disabled adolescents are obese, i.e., 10% higher than typical teenagers (Forman-Hoffman et al., 2015; Calcaterra et al., 2023; Wasniewska et al., 2023). On a general note, the activity level of persons with various disabilities is insufficient to prevent disease and other chronic conditions driven by idleness. Physical activity is the one generally decreasing as young people reach adulthood. However, research shows that specific physical exercise routines can reverse this trend and create favourable conditions for physical activity to remain present in the life of this population (Murphy et al., 2016).

The present methods of adjusted sports fail to study the complexity of life among teenagers with an intellectual disability. Little attention has been given to the motivation required to be physically active in a category at risk that requires increased physical activity (Townsend et al., 2015). However, disabled people usually cannot experience it due to personal and relevant environmental obstacles or the small opportunities to engage in sports or other types of sports from a young age (Franco et al., 2023). Furthermore, as young people become adults, their physical activity level decreases (Ahmed et al., 2016; Kaigang et al., 2016).

Therefore, disabled people do not engage in sufficient physical activity to avoid illnesses related to idleness and other chronic conditions driven by inactivity (Murphy et al., 2016; Reguera-García et al., 2023). However, youths with intellectual disabilities do not entirely benefit from it because they are less likely to be less physically fit; they are more overweight than youths without intellectual disabilities of the same age. Fortunately, previous research (Soffer & Almog-Bar, 2016) has proven that individuals with disabilities can improve their body composition Rimm indicators by exercising (de Souza Marques et al., 2023).

Disabled people are overwhelmingly less physically active compared to their typical peers, which entail a variety of adverse physical consequences (Aksović et al., 2023; Kreinbucher-Bekerle et al., 2023). The outcomes of this idleness manifest in various secondary conditions; we mention cardiovascular disease, i.e., most prevalent cause of death among these people (Forman-Hoffman et al., 2015). Typical persons usually learn useful motor skills and assess sporting activities and other leisure programs from a young age (Wolman & Fraser-Thomas, 2017; Wouters et al., 2019). However, people with disabilities face multiple obstacles to being more physically active, mainly given the absence of proper recreation and adjusted sports programs.

Youth programs positively influence physical activity levels until adulthood (Ahmed et al., 2016; Wichstrom et al., 2013). In contrast, inefficiently designed and unfolded youth programs negatively impact the physical activity level in the future given the low effort or lack of motivation, which have a great influence on forming a great attitude for a child with a disability. Hence, during training, the recommendation is to insist on the regular performance of effective actions, on the constant use of reinforcements and positive thoughts, and on various appreciations concerning the positive elements of subjects (Cardinal et al., 2013).

Unfortunately, disabled youths are increasingly underserved by the recreation and adjusted sports programs, unlike typical youths. This absence of programs entails higher idleness concerning youths with disabilities until adulthood (Jacinto et al., 2023). Providing adjusted sports programs is a crucial trait of a community encouraging equal opportunities (Scifo et al., 2019; Heister et al., 2023).

In addition, it is relevant to mention that the physical activity level is not the only factor influencing muscle mass in boys. Other significant factors include proper nutrition, hormone level, and the quantity and quality of sleep (Giambersio et al., 2023).

5. Conclusions

Generally, adolescents with severe intellectual disabilities tend to have a different body composition than persons without intellectual disabilities. More precisely, individuals with severe intellectual disability tend to have a lower or higher weight than the population's average value.

Concerning physical activity in persons with an intellectual disability, mounting evidence in favour of structured physical exercise programs has been shown for these groups, demonstrating body composition alterations. Furthermore, combined exercise programs have positively affected aerobic capacity and muscle power.

The practice of regular physical activities has numerous beneficial effects on the health of children and adolescents, especially concerning their general health, the improvement of their cardiorespiratory function, muscular and skeletal development, and their mental well-being. We feature below some of the positive effects of practising physical activities among children and teenagers:

- General health improvement: Regular physical activities help to maintain a healthy lifestyle and prevent chronic diseases such as obesity, type 2 diabetes, cardiovascular disease, and arterial hypertension;
- Muscular and skeletal development: Physical activities involving muscular loads, such as weight training or power sports, can help muscular and skeletal development and improve bone density;
- Regular exercise significantly impacts the health of children and teenagers.

However, guidelines of a practical and even methodological nature are not precise concerning the organisation of elements suggested to plan for a training session and the programs to improve the fitness and health of persons with intellectual disabilities.

Finally, the physical activity level is essential, as we have shown throughout this study, in increasing muscle mass in boys. However, it is crucial to consider other factors that can influence this process.

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