

Does physical activity improve adaptive behaviour, fitness, and quality of life of adults with intellectual disability?

A atividade física promove o comportamento adaptativo, aptidão física e qualidade de vida de adultos com dificuldade intelectual e desenvolvimental?

¿La actividad física promueve el comportamiento adaptativo, la aptitud física y los calidad de vida de los adultos con dificultades intelectuales y de desarrollo?

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Keywords:

Moderate activity;
Health;
Adult learning;
Well-being;
Quality of life.

ABSTRACT

The effects of a physical activity program on adaptive behaviour, motor proficiency, fitness, and quality of life of 16 adults with intellectual disability (ID) were analysed. Portuguese versions of Adaptive Behavior Scale, Personal Outcomes Scale, Bruininsky-Oseretsky Motor Proficiency Test, and Fullerton scale were applied twice before, after, and one month after the program. Mann-Whitney and Wilcoxon tests were used and Bonferroni manual correction was performed to establish a new p-value. The control group stabilized performance over time, the experimental group improved in most domains, such as socialization ($p < 0.005$), responsibility ($p < 0.005$), and arm curl ($p < 0.01$). Our findings call for tailor-made interventions to improve PA levels among adults with ID.

Palavras-chave:

Atividade moderada;
Saúde;
Aprendizagem em
adultos;
Bem-estar;
Qualidade de vida.

RESUMO

Os efeitos de um programa de atividade física no comportamento adaptativo, proficiência motora, aptidão física e qualidade de vida de 16 adultos com dificuldade intelectual foram analisados. As versões Portuguesas das Escalas de Comportamento Adaptativo, Pessoal de Resultados, Teste de Proficiência Motora Bruininsky-Oseretsky e Fullerton foram aplicada antes, após e um mês após o programa. Os testes de Mann-Whitney e Wilcoxon foram aplicados, com correção manual de Bonferroni. O grupo de controlo estabilizou o desempenho, o grupo experimental melhorou na maioria dos domínios, como a socialização ($p < 0.005$), a responsabilidade ($p < 0.005$) e a flexão do antebraço ($p < 0.01$). Resultados pedem intervenções personalizadas para melhorar os níveis de AF dos adultos com DI.

Palabras-clave:

Actividad moderada;
Salud;
Aprendizaje de
adultos;
Bienestar;
Qualidad de vida.

RESUMEN

Se analizaron los efectos de un programa de actividad física sobre la conducta adaptativa, competencia motora, aptitud física y calidad de vida en 16 adultos con discapacidad intelectual (DI). Se aplicaron versiones portuguesas de las Escalas de conducta adaptativa, Resultados Personales, Prueba de Competencia Motora Bruininsky-Oseretsky y Fullerton antes, después y un mes después del programa. Se utilizó la prueba de Mann-Whitney y Wilcoxon, con corrección Bonferroni. El grupo de control estabilizó el desempeño con el tiempo, el grupo experimental mejoró en la mayoría de los dominios como socialización ($p < 0.005$), responsabilidad ($p < 0.005$) y flexión del antebrazo ($p < 0.01$). Los resultados exigen intervenciones personalizadas para mejorar los niveles de AF en adultos con DI.

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INTRODUCTION

Intellectual and Developmental Disability (IDD) results from concomitant limitations on intellectual functioning and adaptive skills expressed during the developmental period that impacts cognitive, practical, and social domains (APA, 2013). Adaptive behaviour is a key topic being the most significant predictor in the quality of life (QoL) of persons with IDD (Santos, 2017). People with IDD tend to have limitations in executive functioning, which will affect daily life activities (Woolf et al., 2010). Self-direction and responsibility are some of the competences less stimulated with this subgroup (Santos, 2017). Interpersonal relations/socialization and pre-professional activity need to be attended for social participation (Sartawi et al., 2011) and limitations in the language (Santos, 2017) and self-regulation limitations affect the social participation of this subgroup (Woolf et al., 2010).

Persons with IDD tend to show mobility limitations due to lower tonic and muscular performance (Pitetti and Yarmer, 2002) in which associated with sensory deficits, it leads to less precise and slower motor responses (Carmeli et al., 2008). The gait quality of adults with IDD is influenced by tonic changes (Enkelaar et al., 2013) with an impact on less postural control and greater instability, which affect static and dynamic balance skills (Lahtinen et al., 2007). Adults with ID also present limitations in jumps tasks, due to joint stiffness (Hassani et al., 2014). Low motor proficiency is typical among adults with IDD (Martin et al., 2010): object manipulation (Enkelaar et al., 2013); inhibition of contralateral movements and manual non-preference; non-bilateral symmetry; limitations in lateral dissociation and spatial awareness (Carmeli et al., 2008). Evidence also points out the lower rates of isometric strength and lower limbs (Pitetti and Yarmer, 2002) emphasizing the need to promote physical qualities (Mendonça et al., 2013). Strength training contributes to body posture improvement, reduction in the risk of falls, and less pain. Flexibility training contributes to postural control, increased joint range, and execution of daily activities (Carmeli et al., 2005).

Evidence about the positive outcomes of physical activity (PA) programs are still lacking (Orr et al., 2020). Physical wellbeing and PA engagement are two of the topics on the national and international agenda (Diz et al., 2019). Physical well-being is also one of the QoL conceptual model' domains whose relevance should be determined by the person with ID (Schalock and Verdugo, 2002).

A large proportion of adults with ID is not mastering basic movement skills. PA levels in institutional settings are typically lower than recommended. A lower motor proficiency is associated with less PA regular engagement although some evidence about the practice of PA in improvements in functional capacity, balance, muscle strength, and endurance (Carmeli et al., 2005; Ramos et al., 2017). Our goal is to analyze the effect of a regular PA program on adaptive skills, motor competences, and QoL of adults with institutionalized ID.

METHODS

We recruited a convenience sample of 16 participants, between 24 and 61 years old (42.9 ± 6.5), 9 females and 7 males with IDD diagnosis (mild or moderate) registered in their clinical process, institutionalized. None was engaged in PA programs. Participants were divided randomly into two groups: the experimental group ($n=8$) comprised 5 females/3 males, 26-61 years old (40 ± 6.32), and the control group ($n=8$) comprised 4 females/4 males, 24-55 years old (44.38 ± 6.66). Before the intervention, all participants were weighed and measured.

The validated Portuguese version of the Adaptive Behaviour Scale (PABS) measures the ability of a person, with and without ID, to adapt to his/her environment on a daily basis-routine. The scale has two parts. The first, with 10 domains, focuses on personal independence and responsibility: independent functioning, physical development, economic activity, development language, numbers/time, domestic activity, pre-professional activity, self-direction, responsibility, and socialization. The second part assesses challenging behaviours: social behaviour, conformity, trustworthiness, stereotyped and hyperactive behaviour, sexual behaviour, self-abusive behaviour, social engagement, and disturbing interpersonal behaviour (Santos et al., 2014).

The Bruininks-Oseretsky Test of Motor Proficiency, second edition (TPMBO-2) is a standardized, norm-referenced test that measures the motor proficiency of children and youth from 4 to 21 years old, allowing the planning of motor programs and their monitoring. Items are organized into 4 areas: fine manual control, manual coordination, body coordination; and strength/agility. This test was applied to all participants. The TPMBO-2 is a valid and reliable test (Bruininks and Bruininks, 2005).

The Fullerton Scale assesses physical parameters associated with mobility and functional capacity of people aged 60 or over, through 8 tests: 30s chair stands; arm curls (n° of biceps curls in 30s); body composition; chair sit and reach; 2.44m up and go; back scratch; and six minutes' walk. Each item is scored according to its goal. The psychometric analysis addressed the relevance of the physical components needed for the accomplishment of daily life tasks. This is extremely important for the analysis we intend to do. This test allows the identification of changes due to intervention programs (Rikli and Jones, 1999) and was applied to all participants.

The Portuguese version of the Personal Outcomes Scale (P_POS) assesses the personal outcomes of adults with mild or moderate ID through two versions: self-report and report-of others (support staff or family). Each version has the same 40 items distributed by eight domains (personal development, self-determination; rights, interpersonal relations, and social inclusion; and physical, emotional, and material well-being) and three factors (independence, social participation, and well-being). The higher the final score, the better the QoL. P_POS is valid and reliable (Simões et al., 2016).

In line with the Declaration of Helsinki, we ensure all ethical procedures. The institution executive board previously provided consent for data collection procedures. All participants signed an informed consent form. Instruments were applied, according to their protocols, twice to establish the baseline. Results allowed the planning of centred PA's plan. The same instruments were later repeated after the program and one month after the program ended. Each application took approximately 3 hours.

The Statistical Package of Social Sciences (SPSS) version 25 was used for data analysis.

ADAPTED PHYSICAL ACTIVITY PROGRAM

The baseline assessment data allowed the establishment of individual profiles and identification of strengths and weaknesses. The program considered participants' preferences, motivations, and expectations. The 20-weeks program included biweekly sessions of 50 min each, in a total of 29 sessions. Enjoyment, participants' characteristics (competences and support needs), teamwork and group dynamics, and transfer into daily life activities were considered. All sessions involved three main components: active warmup, core activities, and stretching. The program included rhythmic exercises, muscular strength, and muscular amplitude, spatial orientation, balance, body notion, attention, and memory such as jumping in bows, bypassing pins with a ball, overcoming obstacles, flexing, and extending the forearm

with weights, squats. The exercises were performed using various materials: medicine ball, bows, mat, and weights.

Tasks were planned every week and considered increasing weight load, the number of repetitions, and/or speed.

DATA ANALYSIS

We calculated descriptive statistics. We used non-parametric tests Mann-Whitney (intra-groups comparison) and Wilcoxon (intragroup differences over time). Bonferroni manual correction was performed to establish a new p-value. Thus, the p-value 0.05 was divided in the number of comparisons, in this case, 4. The p-value is significant when $p < 0.0126$.

The significance level was $p < 0.05$ and effect sizes were also analysed (r): small ($.10 < r < .30$), medium ($0.30-0.50$), and large (> 0.50) (Cohen, 1988).

RESULTS

The results were analysed by age, but this variable did not have a significant impact.

Table 1 shows the adaptive behaviour scores of the participants.

The controls tended for higher scores in most adaptive domains, showing a better adaptive profile, except for *numbers/time*, *sexual behaviour*, and *social engagement* domains. Within this group, scores tend to be stable over time, while the experimental

Table 1. Mann-Whitney and Wilcoxon test scores for inter and intra-group comparison – PABS.

PABS – domains	GC vs. GE Mann-Whitney Test			Control Group (Wilcoxon test)		Experimental Group (Wilcoxon test)	
	BAS	FEv	REv	BAS vs. FEv	FEv vs. REv	BAS vs. FEv	FEv vs. REv
Independent Functioning	.59	.59	.75	1.00	1.00	.32	.18
Physical Development	.19	.22	.79	.03	.06	.52	1.00
Economic Activity	.59	.71	.71	1.00	1.00	.18	1.00
Language Development	1.00	1.00	1.00	.32	.32	.56	.32
Numbers/Time	.92	.92	.92	1.00	1.00	1.00	1.00
Domestic Activity	.43	.49	.49	.32	.32	.07	1.00
Pre-Professional Activity	.79	.79	.71	1.00	.32	1.00	1.00
Self-Direction	.63	.32	.34	.32	.32	.03	.32
Responsibility	.56	.48	.83	.05	.02	.03	.005 ($r=.35$)
Socialization	.19	.37	.37	.046	.005 ($r=.35$)	.03	.005 ($r=.35$)
Social Behavior	.15	.11	.11	.66	1.00	1.00	1.00
Conformity	.18	.18	.18	.32	.32	1.00	1.00
Trustworthiness	.92	.96	.92	.18	.16	1.00	1.00
Stereotyped & Hyperactive Behavior	1.00	.92	.96	.32	1.00	.32	.32
Sexual Behavior	.24	.24	.24	1.00	1.00	1.00	1.00
Self-abusive Behavior	.70	.70	.45	1.00	1.00	1.00	.32
Social Engagement	.25	.25	.25	1.00	1.00	1.00	1.00
Disturbing Interpersonal Behavior	.46	.46	.34	1.00	.049	1.00	.26
Total	.92	.75	.80	.67	.39	.01 ($r=.32$)	.016

$p < .0126$; BAS = baseline; FEv = Final evaluation; REv = Retention evaluation; r = effect size; GC = Control Group; GE = Experimental Group

group tended to improve their performance in most domains. No significant differences were found in inter-group analysis (control vs. experimental) in the three evaluation moments. Controls worsen their performance in *physical development, responsibility, and socialization and disturbed interpersonal behaviour*. Participants of the experimental group presented significant differences, although effect sizes tended to be moderate, in *responsibility and socialization* showing a better performance after the program.

Although with no difference in the baseline assessment, participants of the experimental group presented improvements in motor abilities (Tables 2 and 3), over time, in several tests after the program. Effect sizes scores ranged from small to medium.

Balance and strength were the main gains although they are not significant, which allowed a better performance in daily tasks such as walking and sitting. The improvements, despite a slight decrease in retention assessment, were maintained after a month of the end of the program. There were significant positive differences

in effort items and an increase in attention and fluidity of movement, despite with no significant differences. Controls tend to decrease the strength ability (retention). In the intra-group comparison, controls present increases but non-significant differences in balance in the second assessment, while those in the experimental group pointed to non-significant improvements in motor skills: bilateral coordination, balance, upper limbs coordination, fluidity, and strength with a higher total motor proficiency index. The "back scratch arm" in the baseline evaluation was the only item in which the control group performed better.

In the QoL results analysis (Table 4) although the control group, initially and in the self-report version, showed higher rates in *personal development, self-determination, social inclusion, and physical well-being* domains, there is a tendency to a higher satisfaction by the participants of the experimental group, after the program. In the proxy version, only *interpersonal relationships* and *emotional well-being* domains of the control group assuming higher values. In the last two moments of evaluation, it is possible to observe the best scores of the experimental group in most domains of QoL.

Table 2. Mann-Whitney (MW) and Wilcoxon (W) test values for control (CG) and experimental groups (EG) BOMPT-2.

Areas	Control vs. Experimental Group MW			Control Group (W)		Experimental Group (W)	
	BAS	FEv	REv	BAS vs. FEv	FEv vs. REv	BAS vs. FEv	FEv vs. REv
Fine Manual Precision	.19	.15	.20	.71	.16	.46	.16
Fine Motor Integration	.15	.08	.08	.48	.19	.66	.10
Manual Dexterity	.31	.17	.22	.16	.53	.06	.16
Upper Limbs Coordination	.53	.06	.12	.32	1.00	.03	.03
Balance	.75	.04	.03	.053	.21	.04	.04
Run Speed/ Agility	.33	.87	.33	.16	.16	.50	.50
Strenght	1.00	.07	.02	.71	.06	.018	.16
Total	.56	.12	.09	.57	.61	.016	.53
Attention	.25	.02	.03	.32	.56	.08	.32
Fluidity of Movement	.37	.03	.03	1.00	1.00	.03	1.00
Effort	.009	.008 (<i>r</i> =.21)	.003 (<i>r</i> =.19)	1.00	.32	.32	.32
Comprehension	.32	.32	.32	1.00	1.00	1.00	1.00

$p < .0126$; BAS = baseline; FEv = Final evaluation; REv = Retention evaluation; *r* = effect sizes.

Table 3. Mann-Whitney (MW) and Wilcoxon (W) test scores for control (CG) and experimental groups (EG) - Fullerton scale.

Items	Control vs. Experimental Group (MW)			Control Group (W)		Experimental Group (W)	
	BAS	FEv	REv	BAS vs. FEv	FEv vs. Rev	BAS vs. FEv	FEv vs. Rev
Weight_kg	.46	.46	.46	.26	.04	.67	.48
30s chair stand	.29	.007 (<i>r</i> =.17)	.009 (<i>r</i> =.16)	.06	1.0	.38	.22
Arm curl	.71	.01 (<i>r</i> =.15)	.01 (<i>r</i> =.16)	.34	.047	.01 (<i>r</i> =.32)	.046
sit&reach_left leg	.56	.15	.20	.88	.07	.07	.26
sit&reach_right leg	.24	.10	.12	.60	.20	.20	.33
2.44 up & go	.25	.09	.07	.78	.04	.16	.16
Back scratch_left arm	.88	.09	.25	.40	.05	.09	.22
Back_scratch right arm	.40	.14	.14	.18	.89	.01 (<i>r</i> =.32)	.14
6min/m walk	.23	.08	.04	.05	.02	.33	.01 (<i>r</i> =.31)

$p < .0126$; BAS = baseline; FEv = Final evaluation; REv = Retention evaluation.

Table 4. Mann-Whitney (MW) and Wilcoxon (W) test values for control (CG) and experimental groups (EG) – PPOS.

Self-Report	CG vs. EG (MW)			CGroup (W)		EG (W)	
	BAS	FEv	REv	BAS vs. FEv	FEv vs. REv	BAS vs. FEv	FEv vs. REv
PD	.30	.96	.56	.18	.18	.02	.56
SD	.14	.59	.71	.71	.32	.07	.10
IR	.20	.67	.19	.02	.26	.26	.56
SI	.59	.91	.96	.06	1.00	.04	1.00
R	.52	.63	.63	1.00	1.00	.08	1.00
EWB	.08	.25	.21	.56	.32	.41	1.00
PWB	.79	.23	.16	.58	.16	.02	.32
MWB	.26	.20	.20	.16	1.00	.19	1.00
QoL_SR	.88	.60	.49	.03	.10	.02	.20
Proxy							
PD	.49	.96	.71	.18	.16	.03	.16
SD	.34	.33	.55	.56	1.00	.08	.16
IR	.36	.15	.11	.32	.32	.10	1.00
SI	.52	.83	.70	.32	1.00	.05	.32
R	.55	.83	.83	.17	1.00	.32	1.00
EWB	.26	.52	.60	.60	.32	.10	1.00
PWB	.28	.75	.52	.10	.18	.03	.16
MWB	.30	.33	.33	.30	1.00	1.00	1.00
QoL_PR	.40	.75	.92	.91	.18	.01 (r=.32)	.03

p <.0126; BAS = baseline; FEv = Final evaluation; REv = Retention evaluation; PD = Personal Development; SD = Self-Determination; IR = Interpersonal Relations; SI = Social Inclusion; R = Rights; EWB = Emotional Well-Being; PWB = Physical Well-Being; MWB = Material Well-Being; QoL_PR = Quality of Life – Prox Report

DISCUSSION

This article analysed the contribution of an APA program in adaptability, psychomotor skills, and physical fitness and its impact on the QoL of adults with IDD, aiming to be an asset for knowledge' development in the area. One of the strengths was the person-centred approach: participants actively engaged in the design of their individual PA program.

Although no significant differences inter-groups, and with mainly small-medium effect size, the PA program seems to have a positive impact in QoL: participants of the experimental group reported better scores in both versions, even though it is not significant. The long institutionalization may explain the initial similar adaptive and motor profiles (Ramos et al., 2017). After the PA program, participants of the experimental group were more proficient in daily life activities. Even with numbers/time being one of the domains with the lowest score in all measurement moments, participants were stimulated for some activities (counting, classification), which were transferred for routines. The control group tended to present passive attitudes, while participants of the experimental group were more active. We observed an improved performance in adaptive and motor skills (Carmeli et al., 2005) as well as slight improvements in challenging behaviours and may be explained by the teamwork and responsibility promotion. The match between sports clothing, hygiene habits, time-activity, and team rules was also stimulated.

Particular attention was paid to balance, strength, and bilateral coordination, through activities involving overcoming obstacles alternating the lower limbs, promoting joint mobility, and prevention of falls (Carmeli et al., 2005). Movements were faster and more precise in the experimental group. A more successful grip, a more precise, controlled, and directed throw (Enkelaar et al., 2013) with more strength in the launch, exhibiting a more correct posture of the upper limbs during the action (Mendonça et al., 2013) were observed. Jump performance tended to improve, showing more strength and lower limbs amplitude (Hassani et al., 2014). The control group tended to decrease final scores. PA seems to be a valuable support for this subgroup (Carmeli et al., 2005; Ramos et al., 2017) improving the daily life performance.

The control group presented higher scores in baseline assessment but the average scores of the experimental group tend to be higher after the program. It is worth highlighting the small but progressive increase in the self-determination domain of the experimental group (Jo et al., 2018). Social inclusion did not present significant differences in the control group, but in the experimental group was noted an improvement, although not significant, over time.

CONCLUSION

Our findings seem to support the positive impact of APA in motor proficiency, adaptive behaviour, functional capacity, and QoL of adults with ID. One of the strengths

was the active participation of persons with ID in all program planning steps and the inclusion of objective and subjective perceptions of the participants. The promotion of regular PA engagement among persons with ID should be put forward on national and international agenda and considered as non-pharmacological support to be provided for a more functional life as well as a healthier lifestyle. The next step will be the implementation of a PA program in the community.

The reduced sample and the short program duration limit the ability to generalise our findings. A more representative and significant sample (ages, severity level, etc.) should be used. The clinical-biological parameters and VO₂ analyses, the measurement of indirect variables (moderators and mediators), and the identification of variables (self-efficacy and feeling of competence) and predictors have to be considered. Longitudinal and follow-up studies to identify the dose (exercise) response are also needed. The idea is to contribute to healthy lifestyles and a better QoL.

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CONFLICTS OF INTEREST

No conflict of interest to declare.

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