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The Role of Physical Activity and Sports in Enhancing Autonomy in People with Intellectual Disabilities

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A) conception and design of the study
B) acquisition of data
C) analysis and interpretation of data
D) manuscript preparation
E) obtaining funding

Rómulo J. González-García[1,2 A-C-D], Daniel Ordiñana-Bellver[1,2 A-C], Carlos Pérez-Campos[*2 A-B], Gabriel Martínez-Rico[2 A-E]

[1]*Doctoral School, Catholic University of Valencia San Vicente Mártir, Valencia, Spain*
[2]*Campus Capacitas, Catholic University of Valencia, Valencia, Spain*

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***Correspondence:** Carlos Pérez Campos, Sagrado Corazón 5, Godella, 46010 Valencia; email: carlos.perez@ucv.es

Abstract

This study investigates the influence of physical activity participation within occupational centers and engagement in sports outside these centers in the level of autonomy in individuals with intellectual disabilities (ID). A total of 499 participants from occupational centers in the Valencian Community (Spain) were assessed. Autonomy was measured using an adapted version of the ARC-INICO questionnaire, and physical activity was quantified in METs. The findings indicate that activities performed outside occupational centers are positively associated with autonomy, while those conducted within occupational centers show a significant negative relationship, likely due to their structured nature. Individual sports were more effective in enhancing autonomy by promoting self-management and personal control, whereas team sports primarily fostered social skills and a sense of belonging with a lesser impact on autonomy. The study highlights the need for inclusive programs that balance individual and team sports, providing opportunities for the development of autonomy in external environments while ensuring social interaction and emotional support within occupational centers.

Keywords: autonomy, intellectual disability, physical activity, sport.

Introduction

Autonomy, understood as the ability to act and choose independently based on one's own preferences, constitutes a fundamental right and a key factor in the well-being and quality of life of all individuals (Wehmeyer et al., 2020), including those with ID (Frielink et al., 2024). Numerous studies report the positive impact of autonomy on the satisfaction and well-being of this group (Estreder et al., 2023). It is a critical dimension in the personal and social development of individuals with ID and is directly linked to self-determination and psychological well-being (Wehmeyer, 1999). This ability allows people to make decisions and control their own lives, and it is fundamental for their inclusion and full participation in society (Amado et al., 2013).

Physical activity, in turn, represents an essential component for the health and general well-being of individuals with ID, contributing to reducing sedentary behavior and preventing associated diseases (Draheim, 2006). Recent studies indicate that physical activity reduces sedentary behavior and significantly improves the quality of life in this population, providing a non-pharmacological method to enhance general physical health (Nakhostin-Ansari et al., 2023). These benefits can be observed even at moderate activity levels, suggesting that adapted programs could

have a notable positive impact on the physical health of individuals with ID (Temple et al., 2017). Participation in sports activities not only promotes physical well-being but also fosters the development of social skills and improves self-esteem and self-concept (Olvhøj et al., 2022).

Considering these benefits, it is essential to quantify energy expenditure in studies involving physical activity and sports. In this context, Metabolic Equivalent of Task (MET) units are employed, providing a standard for measuring physical effort and energy consumption in daily activities and specific exercises (Ainsworth et al., 2011; Leal-Martín et al., 2021). This metric allows for a precise evaluation of the energy expended during various activities, facilitating their classification according to intensity. Each MET represents the energy cost of being at rest, serving as a reference to calculate the relative intensity of any physical activity compared to this resting state (Ainsworth et al., 2011). Quantifying energy expenditure using MET not only helps assess physical activity levels but also enables the adaptation of exercise programs to individual capabilities, thus optimizing health and well-being benefits (Leal-Martín et al., 2021).

In the field of sports, autonomy plays a crucial role for people with ID. Therefore, it is essential to create inclusive sports environments where these individuals have the opportunity to participate actively, make decisions about their involvement, and choose the activities that interest them the most (Hansen et al., 2023). Creating these inclusive environments involves not only adapting facilities and equipment but also training staff and raising awareness among other participants. It is crucial for coaches and trainers to be equipped to meet the specific needs of people with ID and to foster an environment of respect and understanding among all athletes.

Studies like Howie et al. (2012) analyzed the availability of physical resources and equipment in residential and day center environments for adults with ID, finding that few had access to adequate exercise equipment or recreational areas. Consequently, they recommended increasing sports facilities and recreational spaces to improve physical activity opportunities for this population. Other studies, such as Obrusnikova et al. (2021), explored personal trainers' perceptions of training adults with ID in community fitness facilities. This study concluded that trainers recognize the need for adapted equipment and appropriate spaces to provide an inclusive experience. Furthermore, it highlights the importance of developing training modules to prepare trainers to work with this population, thereby increasing access to physical activity in community settings.

Participation in sports, whether in individual or team modalities, provides different opportunities to foster independence and self-determination in people with ID. Research by Franco et al. (2023) indicates that the type of sports practice (individual vs. team) and its specific characteristics—such as frequency, setting, and social environment—can significantly influence perceived quality of life among individuals with ID. These findings underscore the importance of tailoring interventions to the distinct contexts in which sports are practiced.

Individual sports require participants to take greater personal responsibility for their achievements and develop self-efficacy skills, which contribute to a higher perception of autonomy and control in their daily activities (Wiedenman, 2020). These sports allow individuals to focus their efforts and to progress at their own pace, which is especially beneficial for those seeking to build confidence in their abilities. On the other hand, team sports also play a significant role in the development of autonomy, but do so by strengthening social skills and promoting teamwork. In this context, individuals with ID learn to collaborate, communicate, and make group decisions, which enhances their sense of belonging and their ability to interact effectively with others in social environments (Nota et al., 2007; Di Maggio et al., 2020). The structure of team sports promotes shared autonomy, where each member contributes to a common goal, thereby fostering independence in decision-making and problem-solving within a supportive context (Olvhøj et al., 2022).

The practice of sports, both individual and team, offers unique opportunities for the development of autonomy in people with ID. While individual sports allow for a more personal and direct focus on progress, team sports provide a social interaction context that reinforces autonomy in group settings. These differences suggest that physical activity programs for this population can benefit from a combination of both types of sports, optimizing both personal independence and social inclusion for participants (McConkey et al., 2013). Therefore, it is important to promote autonomy in physical activity and sports for people with ID, providing them with the tools and support necessary to make their own decisions and actively participate in their physical-sports experience (Carey et al., 2023). This includes everything from choosing the activities they wish to engage in to defining their own goals and objectives.

Ultimately, autonomy and physical activity and sports are two elements that complement and reinforce each other for people with ID. By fostering autonomy in the sports domain, individuals are given the opportunity to develop their potential, improve their quality of life, and contribute to a more inclusive society. This study investigates the influence of physical activity participation within occupational centers and engagement in sports outside these centers in the level of autonomy in individuals with ID. This relationship is evaluated in both individual and team sports and using MET as a measure to quantify the level of physical activity.

Method

Participants

A total of 499 individuals with ID from various association centers in the Valencian Community (Spain) participated in this study. Of these, 297 were men (60.61%) and 193 were women (39.39%). Their ages ranged from 12 to 72 years (M=34.26; SD=13.76). Regarding the type of disability, 16.9% had Down syndrome, 7.98% had ASD, and 75.12% had other types of intellectual disabilities. This group included cases whose diagnosis did not fit into the previously mentioned categories or was considered unclassified. Due to the wide variability of conditions, each represented a small percentage of the sample, so they were grouped under this designation. Among the most common forms of intellectual disability in this group are Fragile X syndrome, intellectual disability of unspecified origin, and other developmental disorders with cognitive impairment.

Instruments

To measure the autonomy of individuals with intellectual disabilities, an adapted version of the ARC-INICO questionnaire scale was used (Verdugo et al., 2015). This instrument consists of 5 items rated on a 3-point Likert scale, where 1 means "Never" and 3 means "Always." The scale was adapted into an easy-to-read format with the support of the Confederation Plena Inclusión España to facilitate better understanding and self-completion by participants. This adaptation aimed to improve the accuracy of self-assessment, addressing the cognitive needs of participants and encouraging their involvement in the research process.

Physical activity was assessed using a questionnaire designed to collect information on the frequency, duration, and intensity of physical activities performed both within and outside the occupational center. To calculate energy expenditure, MET units were used, a widely accepted standard for quantifying physical and energy effort in daily activities and specific exercises (Ainsworth et al., 2011). Each MET represents the energy cost of being at rest (approximately 3.5 ml of oxygen per kg of body weight per minute) and serves as a reference to evaluate the intensity of an activity compared to the resting state. The methodology employed involved multiplying the reference values assigned to activities of different intensities (3.3 MET for low-intensity activities, 4 MET for moderate, and 8 MET for high intensity) by the time in minutes dedicated to each activity and the number of days per week it was performed. This provided a quantifiable measure of energy expenditure in MET-minutes per week. According to WHO (2020) guidelines, physical activity levels are categorized as low (<600 MET-min/week), moderate (600–2.000 MET-min/week), and high (>2.000 MET-min/week). This approach has been validated in studies using accelerometers and other tracking tools, demonstrating accuracy in estimating energy expenditure and facilitating the classification of activities by intensity (Hibbing et al., 2006; Staudenmayer et al., 2009; Ellis et al., 2014).

Procedure

Data collection was carried out in person by researchers and trained staff from occupational centers, who administered the questionnaires in a self-completion format in the presence of the researcher or center staff to ensure the comprehension and accuracy of responses. Support was provided to participants who required it, following standardized protocols to minimize biases and ensure the reliability of the information collected.

Data analysis

The data were analyzed using JASP statistical software version 0.18.3 and SmartPLS version 4.9.01. Prior to analysis, the database was examined to identify missing and outlier values. The normality of the variables was assessed using the Shapiro-Wilk test, whose results indicated that the distributions approximated normality, allowing the use of parametric tests. Descriptive statistics were calculated to understand the level of physical-sports activity and autonomy among participants. Additionally, a t-test was conducted to determine whether there were statistically significant differences in the level of physical activity practice within and outside the occupational center. This comparative analysis allowed for the evaluation of changes in energy expenditure and the identification of patterns in physical activity participation across different settings. The effect size was calculated using Cohen's d to interpret the magnitude of the differences (Cohen, 1988).

To evaluate the relationships between variables and test the proposed model, the Partial Least Squares Structural Equation Modeling (PLS-SEM) method was used, implemented in SmartPLS software. The reliability and validity of latent constructs were examined through internal consistency, assessed using Cronbach's Alpha and Composite Reliability, with acceptable values above 0.70; convergent validity, determined by the Average Variance Extracted (AVE), with values above 0.50 indicating good convergent validity; and discriminant validity, analyzed using the HTMT (Heterotrait-Monotrait Ratio), ensuring that constructs were conceptually distinct (Henseler et al., 2015).

For the path coefficients that determine the strength and direction of the relationships between variables, a bootstrapping procedure with 5,000 resampled iterations was applied (Chin, 1998). Additionally, determination coefficients (R^2) were examined to assess the proportion of variance explained in the endogenous variables, and the Standardized Root Mean Square Residual (SRMR)

index was used to evaluate the overall model fit, with values below 0.08 considered indicative of good fit (Hu & Bentler, 1999).

The study complied with international and national ethical standards for research involving human participants. Confidentiality and anonymity were guaranteed, and participants were informed about the purpose of the study, their rights, and the voluntary nature of their participation. Procedures were established to ensure that the assistance provided during data collection did not influence participants' responses. Informed consent was obtained from all participants or their legal guardians, following the ethical guidelines set out in the Declaration of Helsinki and with approval from the Ethics Committee for Research of the Catholic University of Valencia (UCV/2021-2023/213).

Results

The following are the results related to the participants' levels of physical-sports activity, measured in MET-minutes per week, both for sports activities performed within the center and outside it. Regarding physical activity in the occupational center (DC), participants reported an average of 353 MET-min/week (SD = 173 MET-min/week), which represents a low intensity. For sports activities performed outside the center (FC), the average was 295 MET-min/week (SD = 201 MET-min/week), which also corresponds to low activity. The combination of both categories resulted in a total average of 648 MET-min/week (SD = 343 MET-min/week), representing a moderate activity level. This total value reflects the general level of physical activity that participants perform weekly.

To compare the levels of physical activity performed within and outside the occupational center, a paired t-test was conducted. The results revealed a statistically significant difference between the level of physical activity in the center and outside the center, with a t-value of $t(433) = 8.29$, $p < .001$. The effect size, measured using Cohen's d, was 0.40, indicating a small to moderate magnitude effect. The 95% confidence interval for the mean difference ranged from 0.30 to 0.50. These results show that participants engage in significantly higher levels of physical activity within the occupational center compared to the physical activities they perform outside the center.

Table 1. Comparative analysis: Paired samples t-Test

	M (MET-min/w)	dt (METmin/w)	t	gl	P	Cohen´s d	IC (95%)	
							Low	High
DC	353	173	8.29	433.00	<.001	0.40	0.30	0.50
DF	295	201						

Note: DC = Sports practice within the occupational center; DF = Sports practice outside the occupational center.

In the evaluation of Autonomy (AU), adequate internal reliability was achieved, as reflected by a Cronbach's Alpha of 0.75 and a rho_A coefficient of 0.76. Composite reliability (CR) was 0.84, exceeding the recommended threshold of 0.70. The factor loadings of the five items comprising the construct ranged from 0.64 to 0.76, with 95% confidence intervals supporting the accuracy of the estimates. The AVE was 0.51, surpassing the minimum threshold of 0.50, indicating acceptable convergent validity. These results suggest that the Autonomy scale demonstrates adequate reliability and validity.

Table 2. Descriptive, Validity, and Reliability Analysis of the Autonomy Scale

Item	M	SD	S	K	Factor Loadings (CI)	A. Cronbach	rho_a	CR	AVE
AU1	1.94	0.88	0.11	-1.71	.076 (0.71-0.81)				
AU2	1.83	0.83	0.33	-1.48	0.74 (0.69-0.78)				
AU3	1.75	0.84	0.50	-1.41	0.73(0.68-0.78)	0.75	0.76	0.84	0.51
AU4	1.74	0.82	0.51	-1.34	0.64(0.56-0.69)				
AU5	2.08	0.82	-0.15	-1.51	0.69(0.63-0.74)				

Note: M = Mean; SD = Standard Deviation; S = Skewness; K = Kurtosis; CI = Confidence Interval; CR = Composite Reliability; AVE = Average Variance Extracted.

Discriminant validity of the constructs was evaluated using the HTMT (Heterotrait-Monotrait ratio) criterion. The values obtained were below the recommended threshold of 0.85 (Henseler et al., 2015), indicating adequate discriminant validity between the constructs.

Table 3. Discriminant Validity Analysis HTMT

	DC	DF	AU
DC			
DF	0.69		
AU	0.22	0.45	

Note: DC = Sports practice within the occupational center; DF = Sports practice outside the occupational center; AU = Autonomy.

In the analysis of the common model, it was observed that DC had a small negative impact on AU, with a path coefficient (β) of -0.15 and an effect size (f^2) of 0.01. However, DC positively and significantly influenced DF, with $\beta = 0.69$ and $f^2 = 0.92$, indicating a strong relationship. DF, in turn, had a positive and moderate influence on AU, with $\beta = 0.51$ and $f^2 = 0.16$. The determination coefficients (R^2) revealed that the model explained 48% of the variance in DF and 28% in AU. The model's fit index, measured by the SRMR, was 0.08, indicating an acceptable fit.

In the team sports model, the negative impact of DC on AU was even smaller, with $\beta = -0.09$ and $f^2 = 0.01$, suggesting an almost negligible influence. The positive relationship between DC and DF remained strong, with $\beta = 0.69$ and $f^2 = 0.92$. The influence of DF on AU slightly decreased compared to the common model, presenting $\beta = 0.43$ and $f^2 = 0.12$. The R^2 for DF was 47%, while for AU it dropped to 13%, indicating a lower explanatory capacity of the model concerning autonomy. The SRMR remained at 0.08, reflecting an acceptable fit.

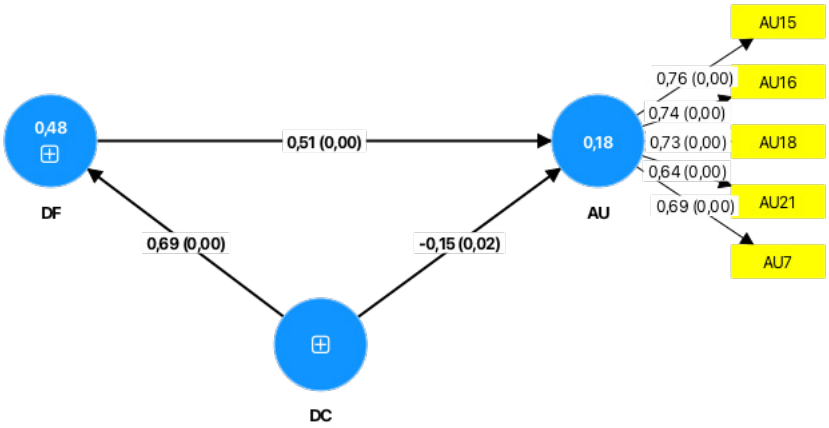
In contrast, the individual sports model showed that DC had a more pronounced negative impact on AU, with $\beta = -0.26$ and $f^2 = 0.06$. The positive influence of DC on DF was stronger, with $\beta = 0.74$ and a high f^2 of 1.28. Notably, DF had a strong positive influence on AU, with $\beta = 0.72$ and $f^2 = 0.37$, demonstrating that physical activity outside the center in individual sports significantly contributes to the development of autonomy. The R^2 values were higher in this model, explaining 55% of the variance in DF and 30% in AU. Additionally, the SRMR decreased to 0.07, indicating a better model fit compared to the previous ones.

Table 4. Structural Model Results: Common, Team, and Individual Dimensions Analysis

	Common				Team				Individual			
	Path (pc)	f2	R2	SRMR	Path (pc)	f2	R2	SRMR	Path (pc)	f2	R2	SRMR
DC ---> AU	-0.15	0.01			-0.09	0.01			-0.26	0.06		
DC ---> DF	0.69	0.92			0.69	0.92			0.74	1.28		
DF ---> AU	0.51	0.16			0.43	0.12			0.72	0.37		
DF			0.48				0.47				0.55	
AU			0.28				0.13				0.30	
Model				0.08				0.08				0.07

Note: SRMR = Standardized Root Mean Square Residual; DC = Sports practice within the occupational center; DF = Sports practice outside the occupational center; AU = Autonomy

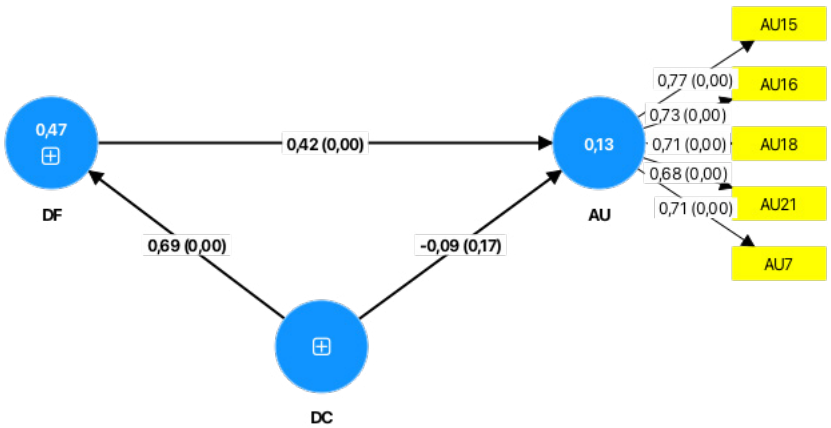
In the common model, as shown in Figure 1, the results indicate that physical activity within the center has a positive and significant relationship with physical activity outside the center (0.69; $p < 0.001$), suggesting that DC may motivate or be associated with practice outside of it. Additionally, FC also shows a positive and significant relationship with autonomy (0.51; $p < 0.001$), indicating that greater participation in external activities is associated with higher levels of autonomy. However, the direct relationship between physical activity within the center and autonomy is negative and significant (-0.15; $p = 0.02$), which could suggest that the directive structure of activities within the center does not favor the development of autonomy. The R^2 for autonomy is 0.18, indicating that only 18% of the variance in autonomy is explained by physical activity within and outside the center.



Note: DC = Sports practice within the occupational center; DF = Sports practice outside the occupational center; AU = Autonomy.

Figure 1. Common Structural Model

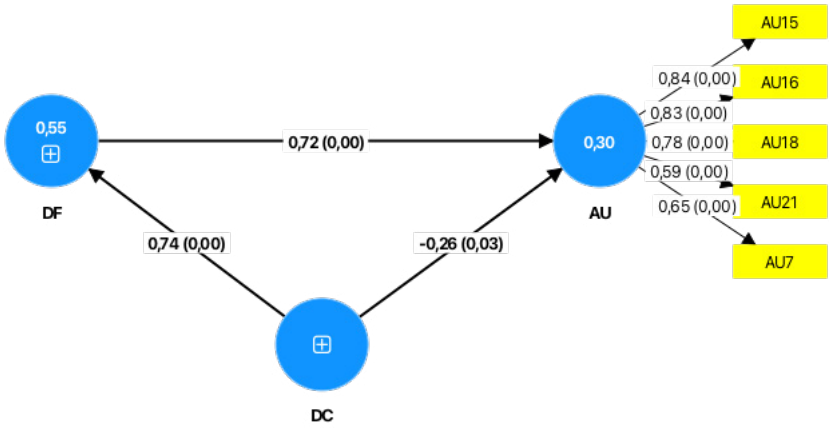
In the team sports model, as shown in Figure 2, the relationship between physical activity within the center and outside the center remains positive and significant (0.69; $p < 0.001$). However, the relationship between physical activity outside the center and autonomy slightly decreases (0.42; $p < 0.001$). Additionally, the relationship between physical activity within the center and autonomy becomes negative but not significant (-0.09; $p = 0.17$). The R^2 for autonomy (AU) decreases further to 0.13, indicating that only 13% of the variance in autonomy is explained by physical activity within and outside the center in this context. This suggests that, in the context of team sports, practice within the center has a less relevant impact on autonomy.



Note: DC = Sports practice within the occupational center; DF = Sports practice outside the occupational center; AU = Autonomy.

Figure 2. Structural Model Associated with Team Sports Practice

In the individual sports model, as shown in Figure 3, the relationship between physical activity within the center and outside the center increases significantly (0.74; $p < 0.001$), as does the relationship between physical activity outside the center and autonomy (0.72; $p < 0.001$). The relationship between physical activity within the center and autonomy is negative and significant (-0.26; $p = 0.03$), suggesting that, in the context of individual sports, physical activity within the center may have a more negative impact on autonomy, possibly due to the lack of independence in guided activities. The R^2 for autonomy (AU) increases to 0.30, indicating that 30% of the variance in autonomy is explained by physical activity within and outside the center.



Note: DC = Sports practice within the occupational center; DF = Sports practice outside the occupational center; AU = Autonomy.

Figure 3. Model Associated with Individual Sports Practice

Discussion

Autonomy is a fundamental pillar in the personal development and quality of life of individuals with intellectual disabilities. Promoting it through various strategies and interventions, in any context, contributes to their full social inclusion and overall well-being (Muñoz-López et al., 2023). Physical activity and sports, in turn, are valuable tools to achieve this goal. Studies such as Chinn (2014) highlight that, despite the promotion of principles of individualization and normalization in the health domain, autonomy remains an underexplored area in relation to health and well-being.

The results of this study reveal significant differences in the levels of physical activity between activities performed within occupational centers and those conducted outside them. The higher frequency and intensity of physical activity within the center (353 MET-min/week) compared to outside the center (295 MET-min/week) could be attributed to the organized and supervised structure of activities within the center, where participants benefit from a supportive environment and the constant assistance of trained staff. The statistically significant difference between the two categories, with a small to moderate effect size (d = 0.40), suggests that the center context provides additional motivation or accessibility that may not be present in external activities. This research validates the interest and efforts of occupational center professionals in promoting physical activity and sports for individuals with disabilities, which inherently serve as facilitators and promoters of improved autonomy and, consequently, quality of life (Marconi et al., 2018).

The results indicate that participants are engaged in significant levels of physical activity, both in the structured environment of the occupational center and in sports activities initiated independently outside the center. The greatest contribution to energy expenditure comes from activities within the center, but considerable participation in external sports activities is also evident. When exploring the impact of physical activity on participants' autonomy, the results suggest that activities conducted outside the center are associated with higher levels of autonomy. This finding may indicate that engaging in physical activity in external environments provides individuals with decision-making opportunities and challenges, which can foster the development of self-determination skills (Hutzler & Almosni, 2019).

In contrast, the negative and significant relationship between physical activity within the center and autonomy may suggest that the directive and guided structure of activities in the center limits participants' opportunities for choice and autonomy in their practice (Gappmayer et al., 2021), despite the broad range of sports activities available within the center. For this reason, it is essential to provide the necessary resources to ensure that individuals with ID can access physical-sports activities outside of occupational centers. Such access can guarantee effective autonomy. These results highlight the need to increase the involvement of the users' close environment, particularly their families, to further promote physical activity and sports outside the occupational center, thereby improving their autonomy and self-determination (van Schijndel-Speet et al., 2014).

The analysis of each model suggests that individual physical activities are more strongly associated with the development of autonomy, while collective activities and the common model show a more limited relationship. Studies such as that by Marconi et al. (2018) point out that individual activities provide greater opportunities for decision-making and self-management, in contrast to the

dynamics of collective activities, where group structures can limit these opportunities. This may indicate that the context and type of physical activity play an important role in fostering autonomy. This observation aligns with research by Franco et al. (2023), who found that the modality of sports and the specific characteristics of each activity can markedly influence perceived quality of life among individuals with intellectual disabilities, underscoring the importance of context-specific interventions. Consequently, individual sports offer a more favorable environment for developing this skill due to their specific characteristics.

These findings align with the work of Šagát et al. (2021), which suggests that individual sports, by requiring personal effort and an independent focus, may be more effective than collective sports in promoting autonomy in individuals with intellectual disabilities. Individual sports allow participants to exercise greater control over their progress and decision-making. In the context of individual sports, the results of this study show a strong influence of physical activity outside the center on autonomy. Practicing individual sports in external environments appears to provide participants with opportunities to face personal challenges and make their own decisions, which strengthens their self-determination skills and sense of autonomy. Moreover, the negative relationship between physical activity within the center and autonomy is more pronounced, suggesting that the structure of guided activities may restrict the independence needed for the development of autonomy in individual sports.

In the context of team sports, the relationship between physical activity outside the center and autonomy slightly decreases, and the negative relationship between physical activity within the center and autonomy becomes non-significant. This suggests that team sports within the center may provide a social environment that fosters a sense of belonging and emotional support, minimizing the direct impact of the directive structure on participants' autonomy. In line with this, studies like Gappmayer (2021) indicate that team sports can act as inclusive spaces that promote social support, which may counteract the potential limitations imposed by highly structured environments.

However, external participation in team sports appears to have a more moderate effect on autonomy, possibly because these activities remain dependent on group dynamics and coordination among team members, which could limit individuals' ability to make autonomous decisions independently. Studies such as Olvhøj et al. (2022) highlight how participation in team sports can provide a sense of belonging and help develop communication skills in adults with intellectual disabilities. Their study demonstrates that team sports facilitate social interaction, helping participants feel part of a community.

Complementing the findings of our study, it becomes evident that while team sports enhance social competencies, their impact on autonomy is lower compared to individual sports. Other studies, such as McConkey et al. (2013) on inclusive physical activity programs, emphasize how team sports can foster social inclusion by enabling joint participation of individuals with and without intellectual disabilities. Although this approach enhances integration and a sense of belonging, the authors found that the benefits in terms of individual autonomy are limited, as the team environment tends to reinforce interdependence. These findings align with the results of this study, which show that while team sports support social development, individual sports appear to be more effective in promoting autonomy.

The results highlight the importance of considering the type of sport and practice environment when designing physical activity programs for people with intellectual disabilities. Studies such as Frielink et al. (2018) found that autonomy-supportive environments significantly contribute to satisfying basic needs and enhancing overall well-being in individuals with intellectual disabilities. This autonomy support is associated with a greater sense of competence and life satisfaction (Frielink et al., 2024). Individual sports outside the occupational center appear particularly beneficial for promoting autonomy, as they provide a space for independent personal development. On the other hand, team sports within the center can be valuable for fostering social participation and a sense of belonging, although their impact on individual autonomy is less pronounced.

These findings underscore the need to tailor physical activity programs to the individual and social characteristics of participants, promoting both autonomy and social integration across various environments and types of sports. However, the three models suggest that other relevant factors affecting autonomy were not captured in this analysis and could be explored in future research.

Future studies could delve deeper into specific aspects not addressed in this investigation. For instance, it would be valuable to examine how the duration and frequency of sports participation influence the development of autonomy over time. Additionally, longitudinal studies could explore whether the effects of individual and team sports on autonomy vary according to age, gender, and the type and severity of intellectual disability, as these factors might moderate the relationship between physical activity and the development of self-determination skills. Further research should also investigate how the context of sports outside the occupational center might offer different opportunities for autonomy and socialization, and how factors such as the type of support received (familial, professional, or community-based) impact outcomes. Finally, incorporating measures of quality of life

and emotional well-being could provide a more holistic perspective on the benefits of physical activity for this population.

This study has certain limitations that should be considered when interpreting the results. First, although the sample is large and representative of the participants' characteristics, it consists solely of users from occupational centers in the Valencian Community (Spain), which may limit the generalizability of the findings to other regions or cultural contexts with different approaches to supporting people with intellectual disabilities. Also, this study concerns the way intellectual disability was categorized. Although most participants were placed into established categories (e.g., Down syndrome or ASD), a considerable proportion was grouped under "other types of intellectual disability" due to the low frequency of each specific condition. This classification could mask relevant differences among subtypes of intellectual disability and therefore limit the ability to draw more nuanced conclusions. Additionally, the self-completion methodology used to measure physical activity levels may have affected the accuracy of the data, as individuals with ID may face challenges in self-perception and in objectively reporting their activities (Temple & Walkley, 2003). Another aspect to consider is that the study does not differentiate between specific sports modalities, whether individual or team-based, which could limit the understanding of how particular activities influence autonomy and social development. Finally, the study did not include a qualitative evaluation of participants' experiences, which could have enriched the analysis by providing deeper insights into the challenges and perceived benefits of sports participation.

These findings hold important implications for professionals supporting individuals with intellectual disabilities (ID) in occupational centers and sports programs. First, occupational center staff could benefit from integrating more autonomy-supportive strategies into daily activities, such as allowing participants to choose which sports they would like to engage in or setting personalized goals together. This approach may help mitigate the directive nature of center-based programs, thus enhancing the sense of control and independence among users. Second, because activities conducted in external environments appear to be associated with higher autonomy levels, professionals might collaborate with community organizations to create accessible sports opportunities outside the center, ensuring that participants have transportation, adapted facilities, and appropriate support. Finally, individual sports should be prioritized for those who wish to strengthen their decision-making and self-management skills, while team sports can be used to foster social inclusion and develop collaborative competencies. By combining both individual and team sports within a structured, yet flexible framework, professionals can address diverse needs, supporting self-determination without neglecting the social benefits of collective activities.

Conclusions

In conclusion, this study emphasizes the importance of prioritizing the integration of individual activities in external environments within physical activity programs for individuals with intellectual disabilities. These activities provide valuable opportunities for decision-making and autonomous problem-solving, which are essential for fostering autonomy. Additionally, the use of MET units as an evaluation tool offers an objective measure of physical effort, enabling the customization of interventions to match the individual capacities and needs of participants.

On the other hand, team sports within the center, although less effective in fostering autonomy, complement these programs by providing a supportive social environment that enhances the sense of belonging, promotes inclusion, and improves the social well-being of individuals with intellectual disabilities.

Ethics approval and informed consent

The study complied with international and national ethical standards for research involving human participants. Confidentiality and anonymity were guaranteed, and participants were informed about the purpose of the study, their rights, and the voluntary nature of their participation. Procedures were established to ensure that the assistance provided during data collection did not influence participants' responses. Informed consent was obtained from all participants or their legal guardians, following the ethical guidelines set forth in the Declaration of Helsinki and with approval from the Ethics Committee for Research of the Catholic University of Valencia (UCV/2021-2023/213).

Competing interests

The authors declare that there are no conflicts of interest.

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References

Ainsworth, B. E., Haskell, W. L., Herrmann, S. D., Meckes, N., Bassett, D. R., Tudor-Locke, C., Greer, J. L., Vezina, J., Whitt-Glover, M. C., & Leon, A. S. (2011). 2011 Compendium of physical activities: A second update of codes and MET Values. *Medicine & Science in Sports & Exercise*, *43*(8), 1575–1581. https://doi.org/10.1249/MSS.0b013e31821ece12

Amado, A. N., Stancliffe, R. J., McCarron, M., & McCallion, P. (2013). Social inclusion and community participation of individuals with intellectual/developmental disabilities. *Intellectual and developmental disabilities*, *51*(5), 360–375.

Carey, E., Ryan, R., Sheikhi, A., & Dore, L. (2023). Exercising autonomy—The effectiveness and meaningfulness of autonomy support interventions engaged by adults with intellectual disability. A mixed-methods review. *British Journal of Learning Disabilities*, *51*(3), 307–323.

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. In G. A. Marcoulides (Ed.), *Modern methods for business research* (pp. 295–336). Lawrence Erlbaum Associates.

Chinn, D. (2014). Critical health literacy health promotion and people with intellectual disabilities. *Asia-Pacific Journal of Health, Sport and Physical Education*, *5*(3), 249–265. https://doi.org/10.1080/18377122.2014.940811

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Erlbaum.

Di Maggio, I., Shogren, K. A., Wehmeyer, M. L., & Nota, L. (2020). Self-determination and future goals in a sample of adults with intellectual disability. *Journal of Intellectual Disability Research*, *64*(1), 27–37.

Draheim, C. C. (2006). Cardiovascular disease prevalence and risk factors of persons with mental retardation. *Mental Retardation and Developmental Disabilities Research Reviews*, *12*(1), 3–12. https://doi.org/10.1002/mrdd.20095

Ellis, K., Kerr, J., Godbole, S., Staudenmayer, J., & Lanckriet, G. (2014). A random forest classifier for the prediction of energy expenditure and type of physical activity from wrist and hip accelerometers. *Physiological Measurement*, *35*(11), 2191–2203. https://doi.org/10.1088/0967-3334/35/11/2191

Estreder, Y., Martínez-Tur, V., Moliner, V., & Gracia, E. (2023). The voice of persons with intellectual disability: Why does autonomy support make them feel better? *Applied Psychology*, *73*(3), 1055–1070. http://doi.org/10.1111/apps.12487

Franco, E., Ocete, C., Pérez-Calzado, E., & Berástegui, A. (2023). Physical activity and quality of life among people with intellectual disabilities: The role of gender and the practice characteristics. *Behavioral Sciences*, *13*(9), 773. https://doi.org/10.3390/bs13090773

Frielink, N., Schuengel, C., & Embregts, P. J. (2018). Autonomy support, need satisfaction, and motivation for support among adults with intellectual disability: Testing a self-determination theory model. *American Journal on Intellectual and Developmental Disabilities*, *123*(1), 33–49.

Frielink, N., Schuengel, C., van der Ven, S. H. G., & Embregts, P. (2022). The prospective associations between autonomy support, basic psychological needs, motivation and well-being among people with a mild to borderline intellectual disability: A two-wave study. *Journal of Intellectual Disability Research*, *68*(10), 1192–1207. https://doi.org/10.1111/jir.13163

Gappmayer, G. (2023). Between risk and autonomy: Producing subjects in group homes and supervised workshops for people with intellectual disabilities. *Disability & Society*, *38*(1), 1387–1409. https://doi.org/10.1080/09687599.2021.1997721

Hansen, E., Nordén, H., & Ohlsson, M. L. (2023). Adolescents with intellectual disability (ID) and their perceptions of, and motivation for, physical activity and organised sports. *Sport, education and society*, *28*(1), 59–72.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8

Hibbing, P. R., Bassett, D. R., & Crouter, S. E. (2020). Modifying accelerometer cut-points affects criterion validity in simulated free-living for adolescents and adults. *Research Quarterly for Exercise and Sport*, *91*(3), 514–524. https://doi.org/10.1080/02701367.2019.1688227

Howie, E., Barnes, T., McDermott, S., Mann, J., Clarkson, J., & Meriwether, R. (2012). Availability of physical activity resources in the environment for adults with intellectual disabilities. *Disability and Health Journal*, *5*(1), 41–48. https://doi.org/10.1016/j.dhjo.2011.09.004

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Hutzler, Y., & Almosni, J. (2019). *Psychological considerations for physical activity participants with intellectual disabilities.* Oxford Research Encyclopedia of Psychology. https://doi.org/10.1093/acrefore/9780190236557.013.328

Leal-Martin, J., Munoz-Munoz, M., Keadle, S. K., Amaro-Gahete, F., Alegre, L. M., Mañas, A., & Ara, I. (2022). Resting oxygen uptake value of 1 metabolic equivalent of task in older adults: A systematic review and descriptive analysis. *Sports Medicine*, *52*(2), 331–348. https://doi.org/10.1007/s40279-021-01539-1

Marconi, V., Pizzolato, F., Donati, D., & Schena, F. (2018). Physical activity levels in people with intellectual disability attending daily centers. *Sport Sciences for Health*, *14*(3), 257–264. https://doi.org/10.1007/s11332-017-0414-1

McConkey, R., Dowling, S., Hassan, D., & Menke, S. (2013). Promoting social inclusion through unified sports for youth with intellectual disabilities: A five-nation study. *Journal of Intellectual Disability Research*, *57*(10), 923–935. https://doi.org/10.1111/j.1365-2788.2012.01587.x

Muñoz-López, S., Molina-Garcia, P., Gutiérrez-Cruz, C., Ubago-Díaz, R., Romero-Ayuso, D., & Ariza-Vega, P. (2023). The influence of meaningful activities in the quality of life and functional autonomy of adults with intellectual disability:

A prospective study during the COVID-19 pandemic. *Journal of Applied Research in Intellectual Disabilities*, *36*(3), 538–546. https://doi.org/10.1111/jar.13077

Nakhostin-Ansari, A., Shayestehfar, M., Hasanzadeh, A., Gorgani, F., & Memari, A. (2023). Organized physical activity and sedentary behaviors in children and adolescents with autism spectrum disorder, cerebral palsy, and intellectual disability. *World Journal of Psychiatry*, *13*(9), 685.

Nota, L., Ferrari, L., Soresi, S., & Wehmeyer, M. (2007). Self-determination, social abilities and the quality of life of people with intellectual disability. *Journal of intellectual disability Research*, *51*(11), 850–865.

Obrusnikova, I., Cavalier, A. R., & Blair-McKinsey, A. E. (2021). Certified personal trainers' beliefs about providing personal training for adults with intellectual disability in a community fitness facility. *Disability and Health Journal*, *14*(3), Article 101100. https://doi.org/10.1016/j.dhjo.2021.101100

Olvhøj, R., Jensen, T. K., Wienecke, J., & Winther, H. (2023). Dream team: team sports in a community of adults with intellectual disability: How can participation in team sports develop the social competencies of people with intellectual disability? In *Special Olympics* (pp. 69–84). Routledge.

Šagát, P., Bartik, P., Lazić, A., Tohănean, D. I., Koronas, V., Turcu, I., Knjaz, D., Alexe, C. I., & Curițianu, I. M. (2021). Self-esteem, individual versus team sports. *International Journal of Environmental Research and Public Health*, *18*(24), Article 12915.

Staudenmayer, J., He, S., Hickey, A., Sasaki, J., & Freedson, P. (2015). Methods to estimate aspects of physical activity and sedentary behavior from high-frequency wrist accelerometer measurements. *Journal of Applied Physiology*, *119*(4), 396–403. https://doi.org/10.1152/japplphysiol.00026.2015

Temple, V. A., Frey, G. C., & Stanish, H. I. (2017). Interventions to promote physical activity for adults with intellectual disabilities. *Salud Pública de México*, *59*, 446–453.

Temple, V., & Walkley, J. (2003). Physical activity of adults with intellectual disability. *Journal of Intellectual and Developmental Disability*, *28*(4), 342–353. https://doi.org/10.1080/13668250310001616380

van Schijndel-Speet, M., Evenhuis, H., van Wijck, R., van Empelen, P., & Echteld, M. (2014). Facilitators and barriers to physical activity as perceived by older adults with intellectual disability. *Intellectual and Developmental Disabilities*, *52*(3), 175–186. https://doi.org/10.1352/1934-9556-52.3.175

Verdugo, M. A., Vicente, E., Fernández-Pulido, R., Gómez-Vela, M., Wehmeyer, M. L., & Guillén, V. M. (2015). A psychometric evaluation of the ARC-INICO Self-Determination Scale for adolescents with intellectual disabilities. *International Journal of Clinical and Health Psychology*, *15*(2), 149–159. https://doi.org/10.1016/j.ijchp.2015.03.001

Wehmeyer, M. L. (1999). A functional model of self-determination: Describing development and implementing instruction. *Focus on Autism and Other Developmental Disabilities*, *14*, 53–61.

Wehmeyer, M. L. (2020). The importance of self-determination to the quality of life of people with intellectual disability: A perspective. *International Journal of Environmental Research and Public Health*, *17*(19), 7121. https://doi.org/10.3390/ijerph17197121

Wiedenman, E. M. (2020). *The role of sport participation on exercise self-efficacy, psychological need satisfaction, and resilience*. Southern Illinois University at Carbondale.

World Health Organization (2021, May 4). *WHO guidelines on physical activity and sedentary behavior.* World Health Organization. https://www.who.int/europe/publications/i/item/9789240014886

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