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Barriers to physical activity participation for adults with intellectual disability: A cross-sectional study

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Abstract

Background: Identifying barriers that can be modified to promote physical activity is important for informing health interventions for adults with intellectual disabilities.

Objectives: Exploring participation in physical activity considering age, sex, living conditions, and health conditions. Further, identifying barriers significantly associated with sedentary activity after adjustment for physical activity correlates.

Methods: A cross-sectional study including physical activity and barrier questions from the POMONA-15 health indicators. Multivariate logistic regression analysis with sedentary activity level as dependent variable.

Results: Among 213 participants with intellectual disabilities, 36% reported predominately sedentary activities, 53% light and 11% moderate/vigorous physical activity. Barriers related to sedentary activity after adjustment were transportation, health conditions, mobility impairment, and lack of activities at the day activity centre.

Conclusions: The findings highlight the need to enhance physical activity opportunities at day activity centres, tailor programmes for wheelchair users, and improve access to physical activity facilities for adults with intellectual disabilities.

KEYWORDS
barriers, exercise, health, intellectual disability, physical activity

1 | INTRODUCTION

Extended periods of sedentary behaviour in the general population have been linked to elevated risks of all-cause mortality, heightened metabolic risk factors, and an increased incidence of various health issues, including cardiovascular disease (CVD), type 2 diabetes, and certain types of cancer (Biswas et al., 2015; Patterson et al., 2018). However, a similar body of evidence has yet to be established for individuals with intellectual disabilities, mainly because of a lack of research in the field (Lynch et al., 2022; Melville et al., 2018). Individuals with intellectual disabilities and sedentary lifestyles are highly likely to develop metabolic syndrome (48.6%), be overweight or obese (69%–87%), and exhibit elevated osteopenia and osteoporosis risks (30%–40%). Moreover, the prevalence of multimorbidity (79%) is high in this population (Lynch et al., 2022; Olsen et al., 2021).

Individuals with intellectual disability spend approximately 12 h (730 min) per day in sedentary pursuits (watching TV, riding in cars, etc.) according to proxy-reported measures (Melville et al., 2017). In

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objectively measured sedentary levels, the mean-time per-day was 8 h (Harris et al., 2019). Sedentary levels are similar in the general population, with 8–9 h of sedentary behaviour per day (Loyen et al., 2017; Patterson et al., 2018). More than 9.5 h of sedentary time per day has been associated with a greater risk of mortality (Ekelund et al., 2019).

Many individuals with intellectual disability tend to be physically less active than the general population. Only 9% of adults with intellectual disabilities meet the recommended minimum of 150 min of moderate-to-vigorous physical activity (MVPA) per week (Dairo et al., 2016), whereas one out of five (22%) individuals in the general population achieve this threshold (Sagelv et al., 2019). Some factors contributing to the barriers for physical activity participation among adults with ID have been explored to a certain extent (Ascondo et al., 2023; Temple, 2007; Vancampfort et al., 2022), but there is a gap in identifying barriers and at the same time adjusting for specific characteristics of individuals that have mainly sedentary activity levels. Some of the identified barriers are intrinsic in nature, such as the presence of a disability, lack of interest in physical activity, and compromised physical and mental health (Ascondo et al., 2023; Stancliffe & Anderson, 2017). The most frequently reported barriers are physical mobility problems and the severity of the intellectual disability (Ascondo et al., 2023; Cartwright et al., 2017; Jacinto et al., 2021; Kreinbucher-Bekerle et al., 2022).

A systematic review by Vancampfort et al. (2022) revealed correlates associated with physical activity participation in adults and older adults with intellectual disability. Among demographic correlates, old age was negatively correlated with physical activity participation, whereas employment status emerged as a positive influence on physical activity participation. Among the biological correlates, physical mobility challenges, obesity, and multimorbidity were identified as negative contributors to physical activity. In addition, individuals with specific physical health conditions such as epilepsy exhibit lower physical activity levels. Regarding psychological, cognitive, or emotional correlates, a more severe level of intellectual disability, the presence of Down syndrome (among older adults), cerebral palsy, and depression were associated with reduced physical activity participation. Interestingly, there seems to be a positive trend in physical activity levels for individuals residing in supported accommodations as opposed to those living independently in their own homes (Hilgenkamp et al., 2012; Hsieh et al., 2017). Participating in day activity programmes or educational programmes was in one study related to low physical activity levels (Hsieh et al., 2017), but higher step count in another (Oviedo et al., 2019). Other reported barriers include insufficient resources or limited engagement from service providers (Laxton et al., 2023; Mahy et al., 2010; Michalsen et al., 2020), communication challenges between family members and paid caregivers (Cartwright et al., 2017), lack of independent access to community exercise facilities, and infrequent engagement in community-based exercise programmes (Stancliffe & Anderson, 2017).

However, to date, no prior study has adjusted for physical activity correlates when identifying the barriers to physical activity participation among adults with intellectual disabilities who lead sedentary lifestyles. Thus, our first objective was to explore the physical activity levels by considering associations between mainly sedentary activity levels and factors such as age, degree of intellectual disability, living situation, and health conditions. Additionally, we assessed the barriers that exhibited a significant association with sedentary activity after adjusting for the identified correlates of physical activity.

2 | METHODS

2.1 | Design and setting

The data used in this study were collected in the North Health in Intellectual Disability (NOHID) study—a cross-sectional multi-centre study including five municipalities in the northern and central regions of Norway (Tromsø, Balsfjord, Narvik, Malvik, and parts of Trondheim). The NOHID study was led by the University Hospital of North Norway (UNN) in Tromsø in close cooperation with St. Olavs Hospital in Trondheim. Data were collected between October 2017 and December 2019.

2.2 | Procedure

Potential participants were identified through specialised intellectual disability services at the University Hospital of North Norway (UNN), St. Olavs hospital, and by accessing information concerning individuals with intellectual disability receiving services from the municipalities of Tromsø, Balsfjord, Narvik, Malvik, and parts of Trondheim. Invitations were sent to eligible participants, followed by telephone contact with guardians or next of kin. The recruitment and data collection processes were performed by research assistants with backgrounds in healthcare, including research nurses, intellectual disability nurses, and physiotherapists.

Data were gathered through structured interviews using the POMONA-15 (P15) health indicators questionnaire (Perry et al., 2010). Interviews were conducted with the participants, their caregivers, or support persons. Questionnaires were completed at the hospital's research unit, in participants' homes, at other preferred locations, or via telephone interviews. A decision was made by the researchers, who had experience of working with individuals with ID, the support person and the person with intellectual disability whether they would be present at the interview and how much they could participate. In seven of the interviews, the person with intellectual disability was the only one present. In 108 interviews, only the support person was present and in 98 interviews both the person with intellectual disability and the support person was present. Information regarding the level of intellectual disability and other health conditions was obtained from the participants' medical records.

The procedures for this study are described in more detail in previous publications from our research project (Olsen et al., 2021, 2022).

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2.3 | Ethics

Whenever feasible, we sought informed consent from individuals with intellectual disabilities. In situations where an individual with an intellectual disability was unable to provide consent, a close relative or guardian acted as their authorised representative and provided informed consent on their behalf. The study was approved by the Committee for Medical Research Ethics, Health Region North (2017/811) and the data protection officers at UNN and St. Olavs Hospital. Furthermore, the trial was registered in Clinical Trials under the identification number NCT03889002.

2.4 | Participants

All individuals with a verified diagnosis of intellectual disability according to the International Statistical Classification of Diseases and Related Health Problems (ICD-10) 10th revision criteria (WHO, 2019) were eligible to participate in this study. In addition, participants were required to be 16 years of age or older and residing in Norway, in the municipalities of Tromsø, Balsfjord, Narvik, Malvik, or Trondheim.

While there were no predefined exclusion criteria, certain individuals were excluded because of circumstances that hindered the acquisition of reliable information or instances in which the intellectual disability diagnosis was withdrawn. The degree of intellectual disability was categorised as mild (IQ 50–69), moderate (IQ 35–49), severe (IQ 20–34), or profound (IQ < 20) (WHO, 2019). Information regarding eligible nonparticipants was available only for the northern region, where 140 of 266 eligible individuals participated, resulting in a participation rate of 53%. The included participants (mean age 36.1) were younger than the excluded participants and nonparticipants, who had a mean age of 42.3 years (Olsen et al., 2021). In the central part of Norway, participation rates were lower, resulting in a sample of 74 participants with an age and sex distribution comparable to that of northern participants (Olsen et al., 2021). Among the 214 participants initially included in the main study (Olsen et al., 2021, 2023), one was excluded from our analysis due to missing physical-activity measurements data. A flowchart of the study inclusion is shown in Figure 1.

2.5 | Measures

2.5.1 | The POMONA-15 survey instrument

The internationally developed POMONA-15 (P15) health indicators (Perry et al., 2010) were developed by a partnership between 13 EU member states with the aim of assessing health disparities among individuals with intellectual disabilities in comparison with the general population (Perry et al., 2010). This comprehensive questionnaire also included questions about physical activity levels, sourced from the Saltin Grimby Physical Activity Questionnaire (SGPALS) (Grimby

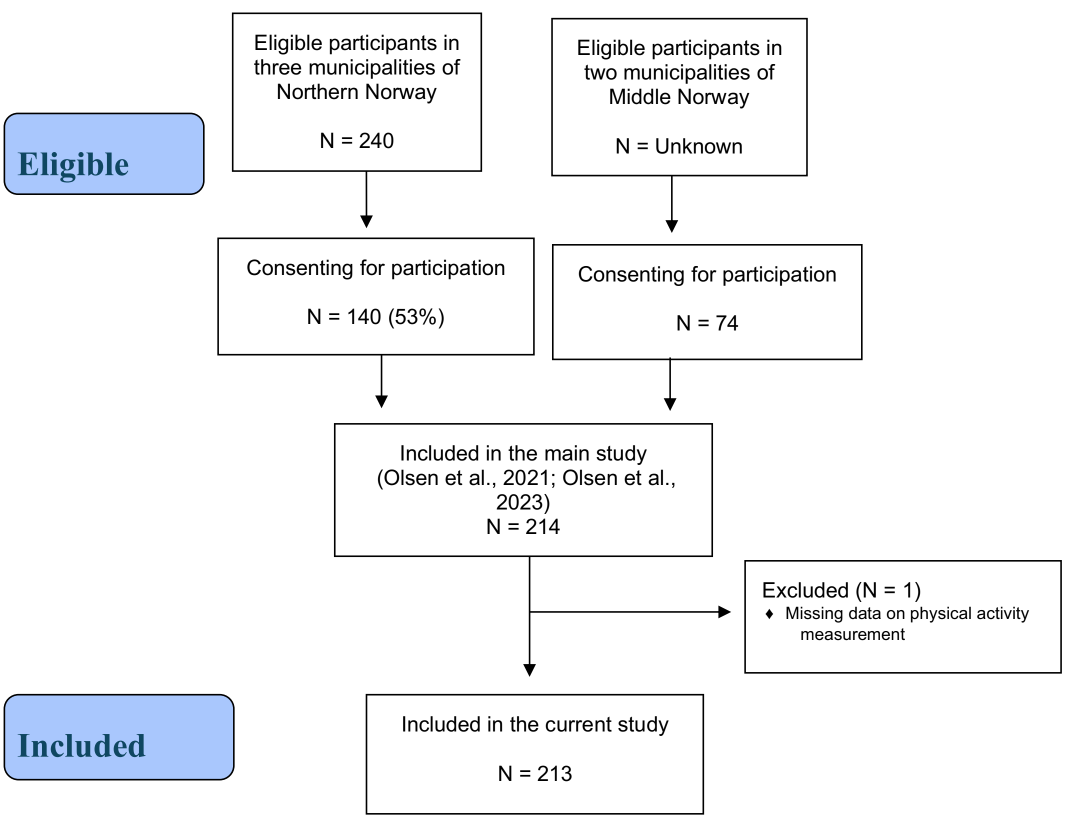

FIGURE 1 Flow chart of included participants (ref. STROBE).

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et al., 2015). The questionnaire also incorporated a list of 15 barriers that impede participation in physical activity among individuals with intellectual disabilities. We used the P15 questionnaire to gather data on demographics, physical activity levels, and health conditions.

The P15 questionnaire includes a comprehensive list of medical conditions, including asthma, allergies, diabetes, cataracts, hypertension, heart attacks, stroke, chronic obstructive pulmonary disease/emphysema, arthritis (both osteoarthritis and rheumatoid arthritis), osteoporosis, peptic ulcers, and various forms of cancer, including leukaemia, migraines or recurrent headaches, constipation, thyroid disorders, and epilepsy. NOHID also documented other frequently occurring conditions, such as skin conditions and musculoskeletal problems. In order to reduce number of variables and avoid small numbers, physical health conditions with prevalence of 25% or greater (Olsen et al., 2021) were included in further analyses in the current study.

Multimorbidity was defined as the presence of one or more physical health conditions in addition to a diagnosis of intellectual disability in accordance with the WHO guidelines (WHO, 2019). Notably, a diagnosis of Down syndrome, autism, or cerebral palsy was noted as an underlying diagnosis rather than a physical health condition.

Information about weight from informants was obtained from 194 out of 213 participants, with 9% having missing data. In a subset of participants ($n = 50$) from the Tromsø region, weight measurements were conducted at the clinical trial unit.

The Aberrant Behavior Checklist-Community (ABC-C) (Aman et al., 1985) is used to assess challenging behaviours and has been validated for use in a Norwegian population with neurodevelopmental disabilities (Halvorsen et al., 2019) The 58-items checklist is divided into five subscales: irritability, social withdrawal, stereotypical behaviour, hyperactivity/noncompliance, and inappropriate speech. It functions as a proxy measure, requiring input from individuals familiar with the person with intellectual disability. Each item is scored on a scale from 0 (least) to 3 (most) severe behaviour.

The Moss Psychiatric Assessment Schedules (Check) (MPAS, previously known as the PAS-ADD Checklist) is a questionnaire developed to identify potential mental illnesses in people with all levels of intellectual disability (Moss, 2012). Three subscale scores were generated: Organic Condition, Affective/Neurotic Disorder, Psychotic Disorder. Each subscale has a specified threshold score; scores equal to or above this threshold indicate that further clinical or mental health assessments are advised. Independent replication of the psychometric properties of the MPAS-Check revealed acceptable internal consistency. The MPAS-Check was found to be sensitive to variations between diagnostic groups and had an overall sensitivity of 66% and a specificity of 70% (Sturmey et al., 2005).

Both ABC-C and MPAS-Check were incorporated into the P15 questionnaire.

2.5.2 | Living conditions

Participants' living conditions were classified into three categories: living alone, living with family, or living in apartments attached to services (Molden et al., 2009). In Norway, adults with intellectual disabilities typically reside in individual apartments where they receive municipal support based on their specific requirements. Some individuals lived independently, whereas others lived in clustered apartments with shared housing.

2.5.3 | Motor function

The Gross Motor Function Classification System Extended and Revised (GMFCS E&R) categorises gross motor functioning into five levels, with lower levels indicating better function. The GMFCS E&R was developed for persons with cerebral palsy (Palisano et al., 2008) and has high inter-rater reliability (McCormick et al., 2007). The scale assesses gross motor function across five levels.

Level 1: Individuals may exhibit limitations in advanced motor skills (e.g., speed and balance) but can typically walk without constraints.

Level 2: Those at this level often require handrails to navigate the stairs and can walk without assistance, although they may occasionally use devices such as crutches or wheelchairs.

Level 3: Individuals in this category typically rely on mobility aids indoors and require wheelchairs outdoors.

Level 4: People at this level typically depend on wheelchairs for mobility.

Level 5: This signifies the requirement for a wheelchair and additional support for sitting.

Although the GMFCS E&R has been used in studies involving adults with intellectual disabilities (Dijkhuizen et al., 2018; Olsen et al., 2021), it has not been formally validated for use in this population.

2.5.4 | Physical activity

As part of the P15 questionnaire, the assessment of physical activity level utilised a modified version of the Saltin Grimby Physical Activity Level Scale (SGPALS) (Grimby et al., 2015). Respondents were asked, 'How much of your leisure time have you been physically active in the last year?' with four response categories: (1) 'Participating in hard training or sports competitions regularly more than once a week', (2) 'Jogging and other moderate sport or heavy gardening for at least four hours each week', (3) 'Walking, cycling or other forms of light exercise at least four hours a week', or (4) 'Reading, TV or other sedentary activities'. In addition, the questionnaire included a question regarding work activity: 'If you are in paid or unpaid work, how would you describe your work?' The response categories for this question were as follows: (1) 'Mainly sedentary activity (e.g., sitting by a desk),' (2) 'Work that involves walking (e.g., salesman, light industrial work, teaching)', (3) 'Work that involves heavy lifts (e.g., care worker, builder)', and (4) 'Heavy manual labour' (Sagelv et al., 2019). These questions have been used in the longest-running and most comprehensive population study conducted in Norway, known as the Tromsø

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study (Hopstock et al., 2022). Furthermore, the P15 questionnaire included the question, 'Do you work out enough to get sweaty at least once a week?' with response options 'yes', 'no', 'don't know/ unclear'.

To assess the overall physical activity levels of the participants in in their everyday life, the SGPALS question about leisure physical activity, and the question about levels of activity during paid or unpaid work, derived from the Tromsø study, yielded a new composite variable labelled 'total physical activity'. During the creation of this variable, all participants who had responded 'reading, TV or other sedentary activities' (response category 4) as their leisure physical activity level, but had reported 'work that involves walking', 'work that involves heavy lifts', or 'heavy manual labour', were changed to the physical activity category 'walking, cycling or other forms of light exercise at least four hours a week' (response category 3); that is, not sedentary activity. This adjustment from response categories 4 to 3, mainly from sedentary to active, was applied to 21 participants.

In our analyses, we used the new variable 'total physical activity', which had a 4-level scale (encompassing sedentary behaviour, light activity, moderate activity, and vigorous activity). In some analyses, we simplified this scale into a dichotomous classification: 'active' (comprising light, moderate, and vigorous activities) and 'sedentary'.

Sedentary behaviour

In many studies, sedentary behaviour is defined as any waking behaviour with an energy expenditure of less than <1.5 metabolic equivalents (METs), during which one is in a seated, reclined, or lying posture (Lynch et al., 2022; Melville et al., 2018; Patterson et al., 2018).

In this study, sedentary behaviour was referred to as 'doing mainly sedentary activities' and defined as engaging in activities such as 'reading, watching TV, or other mainly sedentary activities' (response category 4, SGPALS) and 'mainly sedentary activities at work' (response category 1, work question derived from the Tromsø study). In this article, the term 'sedentary activity' is used to describe responses for category 4 from SGPALS and category 1 from the work question.

Barriers

The P15 questionnaire included a single question on barriers to participation in physical activity. The question was framed as follows: 'Do you have difficulties with physical activity participation for the following reasons?' It presents 15 different barriers, each with a 'yes' or 'no' response option. The barriers are presented in Table 1. There were two response choices available if the participant could not relate to any of the provided barriers: 'cannot answer/unclear/don't know' and 'refuse to answer'. Each participant identified several barriers. A 'yes' response was categorised as a barrier to participation in physical activity.

TABLE 1 Presented barriers for physical activity participation in the POMONA-15 questionnaire.

Barriers for physical activity participation
Cannot use public transport
Does not like to exercise
No one to go with
Easily tired
Health related issues (including obesity)
Needs help but no one helps
Severity of intellectual disability
No transport possibilities
No available exercise activities
No available activities at the day care centre
Use of wheelchair/mobility impairment
Not allowed
Not enough time
Not enough money
Age

2.6 | Data analysis

Descriptive statistics were used to obtain an overview of data. Continuous variables, such as age, are presented as means with standard deviations (SD) or medians with ranges. Categorical variables are presented as percentages of the defined categories. Associations between the dichotomised physical activity groups were investigated with One-way ANOVA for the continuous variable age and with the Pearson chi-square test or the non-parametric Fisher exact test for categorical variables.

Barriers that were significantly associated with dichotomised physical activity level (sedentary/active) in cross-tabulation analysis were further analysed in binary logistic regression analyses with dichotomised level of physical activity (sedentary/ active) as the dependent variable. Independent adjustment variables were included based on prior knowledge from the literature (level of intellectual disability) or because of a statistically significant association with sedentary activity in the first analysis ($p < .05$). In the multivariate logistic regression analyses of the associations between level of sedentary activity and barriers, we adjusted for the following variables in different combinations: age (continuous), level of intellectual disability (mild, moderate, severe, or profound), gross motor function classification (level 1–2 /level 3–5), epilepsy (yes/no), and Down syndrome (yes/no). The first analyses only included the dependent variable sedentary activity level (yes/no) and the barrier (yes/no). The three combinations of added covariates were: age, level of intellectual disability and epilepsy; age, level of intellectual disability and Down syndrome; and age, level of intellectual disability and GMFCS level. The combinations are displayed in Table 5. The diagnosis cerebral palsy was not included because of its small number ($n = 24$) and its moderate correlation with gross motor function. The entry method was applied. Multicollinearity was assessed. Correlations were made to ensure that none of the variables were highly correlated with each other, with a Spearman's correlation cut-off of 0.7. Model fit was assessed using the Hosmer–Lemeshow goodness-of-fit test. The degree of pseudo-explained variance was reported using Nagelkerke's R square.

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TABLE 2 Participant characteristics.

Characteristics	Total (*N* = 213)
Gender, *n* (%)	
Men	119 (56)
Women	95 (44)
Age (years), mean (SD)	36.1 (14)
Median (range)	32.5 (16–78)
Living condition, *n* (%)	
Lives independently	25 (12)
Lives with family	41 (19)
Group home with care	147 (9)
Down syndrome, *n* (%)	40 (19)
Autism diagnosis, *n* (%)	47 (22)
Cerebral Palsy, *n* (%)	24 (11)
Level of intellectual disability, *n* (%) (*n* = 205)	
Mild	82 (39)
Moderate	56 (26)
Severe	49 (23)
Profound	17 (8)
Unknown	9 (4)
Gross motor function classification scale	
Level 1	122 (57)
Level 2	55 (26)
Level 3–5	36 (17)
Weight, *N* = 194, *n* (%)	
Underweight	17 (8)
Normal	62 (29)
Overweight	60 (28)
Obese	55 (26)
Physical health conditions, *n* (%)	
Epilepsy	55 (26)
Allergies	68 (32)
Visual aids	92 (43)
Musculoskeletal disorders	53 (25)
Multi-morbidity, one physical health condition	168 (79)
Multi-morbidity, two or more physical health conditions	117 (55)
Numbers of physical health conditions, median (IQR)	2 (1–3)
Mental health	
ABC-C[a], mean (SD), *n* = 196	
Irritability	5.0 (6.6)
Social withdrawal, *n* = 197	3.3 (4.0)
Stereotypic behaviour, *n* = 197	1.3 (2.3)
Hyperactivity/noncompliance	4.9 (6.5)
Inappropriate speech	1.5 (2.2)
MPAS[b] (Check), mean (SD), *n* = 196	
Affective/neurotic	1.8 (3.5)
Organic condition	1.0 (1.8)
Psychotic	0.4 (0.8)

[a]ABC-C, Aberrant Behaviour Checklist-Community.
[b]MPAS (Check), Moss Psychiatric Assessment Schedules (Check).

3 | RESULTS

3.1 | Participant characteristics

As shown in Table 2, the study included a sample of 213 individuals with intellectual disabilities, of whom 56% were men. The age of the participants ranged from 16 to 78 years (mean = 36.1 years; SD = 13.8). Additionally, 48 individuals (22%) were diagnosed with autism, 40 (19%) were diagnosed with Down syndrome, and 24 (11%) had cerebral palsy. Information regarding the level of intellectual disability was available for 205 participants, with the following distribution: mild, 82 (39%); moderate 56 (26%); severe 49 (23%); profound 17 (8%); and unknown, nine (4%). Multimorbidity, defined as the presence of one or more physical health conditions, was observed in 168 participants (79%). Only 196 participants completed the questionnaires for aberrant behaviour (ABC-C) and mental illness (MPAS). In the ABC-C and MPAS questionnaire data, missing values in the dataset were handled using the imputation methods recommended in the manual for screening instruments (Aman et al., 1995).

3.2 | Levels of physical activity

In response to the Saltin–Grimby questionnaire regarding leisure time physical activity, the reported levels of physical activity were distributed as follows: 46% mainly engaged in sedentary physical activity, 43% participated in light physical activity, 7% in moderate physical activity, and 4% in vigorous physical activity. When we considered the total physical activity score, which combines work and leisure activities, 36% had mainly sedentary activity, 53% engaged in light physical activity, 7% had moderate physical activity, and only 4% reported vigorous physical activity. The distribution of the 4-category total score for physical activity in relation to age, sex, degree of intellectual disability, living situation, health conditions, motor function, and weight is shown in Table S1.

For further analysis, the total physical activity variable were categorised into two levels: active (light, moderate, and vigorous activity) and sedentary. As shown in Table 3, participants reporting predominantly sedentary activities had a mean age of 40 years (SD = 15), which was significantly higher than that of participants in the active category (mean 34 years, SD 13; $p < .001$).

Individuals with lower gross motor function (level 3–5) or a diagnosis of cerebral palsy were more likely to report mainly sedentary activity, with 83% falling into this category, in contrast to 23% of individuals with a diagnosis of Down syndrome.

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Among those with epilepsy, 52% reported predominantly sedentary activity, a higher proportion compared to active individuals. Although underweight was statistically associated with being less active ($p < .05$), the underweight variable comprised only 17 participants, potentially leading to unreliable results. Consequently, the 'weight' variable was not included in the logistic regression analyses. No statistically significant differences were observed in terms of sex, level of intellectual disability, aberrant behaviour, or mental illness between groups with active or mainly sedentary activity levels.

3.3 | Barriers to physical activity participation

The most prevalent barrier hindering participation in physical activity was 'not able to use public transport', affecting a total of 62 participants (29%) (Table 3). Within this group, significant differences ($p < .05$) were noted between active participants (24% could not use public transport) and sedentary participants (39% could not use public transport). 'No one to go with' was a barrier for 28% of participants, while 'Needs help but no one helps' applied to 25% of them. In addition to 'cannot use public transport', the barriers that were statistically significant associations with being in the sedentary group included: 'easily tired', 'health related issues', 'severity of the intellectual disability', 'no available day care centre activities', and using a 'wheelchair'. Furthermore, 'no available exercise activities' was reported by 25% of those with a sedentary activity level, which represented a nearly statistically significantly higher proportion compared to the active group (15%) ($p = .075$). All barriers are presented in Table 4 with association to physical activity participation and *p*-values.

In the multivariate logistic regression analyses exploring the associations between mainly sedentary activity and barriers, we incorporated adjustments for variables that were significantly associated with sedentary activity level ($p < 0.05$), in addition to level of intellectual disability. The variables included age, level of intellectual disability, gross motor function, epilepsy, and Down syndrome (Table 3).

Table 5 presents the association between the six barriers (selected based on statistical significance in cross-tabulation) and the sedentary activity level in both univariate (unadjusted) and multivariate analyses. Various combinations of covariates including age, level of intellectual disability, gross motor function, epilepsy, and Down syndrome, were included in the analyses. All six barriers remained significantly associated with sedentary activity level when adjusted for age and level of intellectual disability. Moreover, incorporating epilepsy or Down syndrome as additional control variables did not disrupt the significant associations. However, when adjusting for low gross motor function, the association between barriers and sedentary activity became non-significant in three out of the six analyses. An important exception was observed with the barrier 'No available activities at the day care centre', which maintained a robust association with physical activity levels (unadjusted OR 3.0, 95% CI 1.44–6.25). In addition, the use of a wheelchair had the highest odds ratio, 17.5 (95% CI 6.43–47.76), with minimal changes observed when introducing the adjustment variables.

4 | DISCUSSION

The primary objective of this study was to investigate the associations between mainly sedentary activity level and barriers to physical activity participation while considering factors such as age, sex, living situation, and health condition. Specifically, we aimed to identify barriers significantly associated with sedentary activity within the population with intellectual disability, adjusted for physical activity correlates. Our study findings revealed that approximately one third of the study population primarily engaged in sedentary activities in both daytime and leisure settings. In multivariable analyses, the three barriers hindering physical activity participation was related to wheelchair use, absence of available activities at day activity centres and severity of the intellectual disability. Importantly, these barriers were significantly associated with a higher level of sedentary activity, even after adjusting for age, intellectual disability, health conditions, and gross motor function.

The absence of available activities at day activity centres was a barrier that was significantly associated with sedentary activities. This finding has been reported in other studies that investigated physical activity participation in group homes or day activity centres (Laxton et al., 2023). In a study measuring the levels of sedentary behaviour in a population with intellectual disability, longer periods of sedentary time were observed during the daytime (Harris et al., 2019). As many individuals with intellectual disabilities spend most of their time during the day in day-activity centres, developing community-based interventions for physical activity in day-activity centres can provide an opportunity to reduce sedentary behaviour.

Another frequently reported barrier to participation in physical activity was the inability to use public transportation. Park and Chowdhury (2022) investigated the use of public transportation by disabled individuals in New Zealand. In this study, 2% of the participants had an intellectual disability, which can be interpreted as if those with intellectual disabilities being less frequent users of public transport in a disabled population. Transport difficulties have been identified as a barrier in several other studies as well (Dixon-Ibarra et al., 2017; Mahy et al., 2010; Michalsen et al., 2020). Thus, there may be a need to organise specially arranged transport systems. Furthermore, governments must ensure accessibility and that public transport meets inclusive design guidelines and standards (Park & Chowdhury, 2022).

Article 30 of the 2006 Convention on the Rights of Persons with Disabilities (CRPD) states that people with disabilities have the right to be included in all cultural life, recreation, leisure, and sports activities. They have the right to be encouraged to participate and opportunities to organise, develop, and participate in disability-specific sports and recreational activities. They should ensure access to all services provided within the community. Nevertheless, many individuals with intellectual disabilities in Norway are not offered these adjustments,

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TABLE 3 Sedentary versus active levels of physical activity in association to demographics and health conditions in 213 participants. *p*-Values below 0.05 are in bold.

	Total *N* = 213 (100%)	Sedentary *N* = 78 (37%)	Active *N* = 135 (63%)	*p*-Value
Age mean (SD)	36.1 (13.9)	40.0 (15.1)	33.9 (12.7)	**.002**
Median (IQR)	33 (24–47)	38 (28–51)	31 (24–44)	
Gender (%)				
Men	119 (56)	38 (49)	80 (59)	
Women	95 (44)	40 (51)	55 (41)	.136
Level of intellectual disability (%) n204				
Mild	82 (40)	28 (34)	54 (66)	
Moderate	56 (28)	19 (34)	37 (66)	
Severe/profound	66 (32)	28 (42)	38 (57)	.510
Gross motor function				
Level 1	122 (57)	27 (22)	95 (78)	
Level 2	55 (26)	21 (38)	34 (62)	
Level 3–5	36 (17)	30 (83)	6 (17)	**<.001**
BMI, *n* = 194 mean (SD)	26.9 (6.3)	27.1 (6.1)	26.4 (6.7)	.449
Living condition, *n* (%)				
Lives independently	25 (12)	7 (28)	18 (72)	
Lives with family	41 (19)	12 (29)	29 (71)	
Group home with care	147 (69)	59 (40)	88 (60)	.281
Down syndrome	40 (19)	9 (22)	31 (78)	**.040**
Autism diagnosis	47 (22)	15 (32)	32 (68)	.477
Cerebral Palsy	24 (11)	20 (83)	4 (17)	**<.001**
Weight (%) (*n* 194)				
Underweight	17 (9)	10 (59)	7 (41)	**.018**
Normal	62 (32)	18 (29)	44 (71)	.422
Overweight	60 (31)	18 (30)	42 (70)	.553
Obese	55 (28)	18 (33)	37 (67)	.961
Physical health conditions, n (%)				
Epilepsy	55 (25.8)	29 (52)	26 (47)	**.003**
Allergies	68 (31.9)	22 (32)	46 (68)	.320
Visual aids	92 (43.2)	34 (37)	58 (63)	.965
Musculoskeletal disorders	53 (24.9)	20 (38)	33 (62)	.846
Multi-morbidity, one physical diagnosis, *n* (%)	95 (44.6)	33 (35)	62 (65)	.666
Multi-morbidity, two or more physical diagnosis, *n* (%)	117 (54.9)	44 (38)	73 (62)	.666
Numbers of physical health conditions, mean (SD)	1.99 (1.7)	2.25 (1.8)	1.84 (1.6)	.097
ABC-C, mean (SD)				
Irritability	5.02 (6.61)	5.43 (6.54)	4.79 (6.69)	.360
Social withdrawal	3.34 (3.98)	3.08 (3.41)	3.32 (4.11)	.745
Stereotypic behaviour	1.32 (2.30)	1.07 (1.84)	1.41 (2.50)	.372
Hyperactivity/noncompliance	4.87 (6.47)	3.91 (5.37)	5.37 (6.97)	.188
Inappropriate behaviour	1.53 (2.20)	1.36 (2.22)	1.62 (2.22)	.334
MPAS-Check, mean (SD)				
Affective/neurotic	1.77 (3.46)	1.59 (3.13)	1.84 (3.63)	.564
Organic condition	1.00 (1.75)	1.12 (1.68)	0.90 (1.71)	.245
Psychotic	0.39 (0.84)	0.34 (0.80)	0.42 (0.86)	.629

Abbreviations: ABC-C, Aberrant Behaviour Checklist Community; MPAS (Check), Moss Psychiatric Assessment Schedules (Check).

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TABLE 4 Sedentary versus active levels of physical activity in association to 15 barriers for physical activity participation in 213 participants. Pearsons Chi-squared test. *p*-Values below .05 are in bold.

Barriers with decreasing prevalence	Total *N* = 213 (100%)	Sedentary (col%) (row%) *N* = 78 (100%)	Active (col%) (row%) *N* = 135 (100%)	*p*-Value
Cannot use public transport (*n* = 212)	62 (29)	30 (39)	32 (24)	**.019**
Does not like to exercise (*n* = 210)	60 (28)	26 (35)	34 (25)	.145
No one to go with (*n* = 211)	59 (28)	22 (29)	37 (27)	.881
Easily tired (*n* = 212)	60 (28)	29 (38)	31 (23)	**.022**
Health related issues (including obesity) (*n* = 212)	56 (26)	29 (38)	27 (20)	**.005**
Needs help but no one helps (*n* = 211)	53 (25)	20 (26)	32 (24)	.673
Severity of intellectual disability (*n* = 212)	45 (21)	25 (33)	20 (15)	**.003**
No transport possibilities (*n* = 212)	36 (17)	9 (12)	27 (20)	.121
No available exercise activities (*n* = 212)	40 (19)	19 (25)	20 (15)	.075
No available activities at the day care centre (*n* = 212)	37 (17)	21 (27)	15 (11)	**.003**
Wheelchair (*n* = 212)	36 (17)	31 (40)	5 (4)	**<.001**
Not allowed (*n* = 211)	15 (7)	3 (4)	11 (8)	.239
Not enough time (*n* = 212)	11 (5)	1 (1)	10 (7)	.054
Not enough money (*n* = 212)	10 (4.7)	5 (7)	5 (4)	.357
Age (*n* = 212)	9 (4.2)	2 (3)	7 (5)	.369

as they are not part of Norwegian legislation on human rights. In the current study, the barrier 'wheelchair' was significantly related to doing mainly sedentary activities, indicating that having mobility problems and using a wheelchair are hindrances to physical activity participation, which would be a direct contradiction to CRPD. Physical mobility problems have consistently emerged as the primary barrier to participation in physical activity (Ascondo et al., 2023; Cartwright et al., 2017; Jacinto et al., 2021; Vancampfort et al., 2022). There is a noticeable scarcity of physical activity interventions tailored to individuals with intellectual disabilities who use wheelchairs (Hassan et al., 2019) compared with those with intellectual disabilities but without mobility problems.

The findings indicate a reported sedentary behaviour in 35% of the study population, which is lower than the level reported by other cross-sectional studies using self-reported physical activity measurements for individuals with intellectual disabilities (Melville et al., 2018). Furthermore, our results indicate that individuals with intellectual disabilities have sedentary behaviour comparable to those observed in the general population, where approximately 36% engage in mainly sedentary activities (Loyen et al., 2017).

However, when comparing levels of moderate-to-vigorous physical activity between the study and the general population, there is a possible discrepancy between the two populations. In the current study, 11% of the study population reported engaging in regular moderate or vigorous physical activity. In a representative urban Norwegian population, 28% of participants reported this level of physical activity in 2016, referred to as the proportion engaging in exercise (Morseth & Hopstock, 2020). The study participants were young with a median age of 33 years. Increasing the levels of physical activity with higher intensities yield numerous health benefits, such as increased cardiovascular and muscular capacity (Sun et al., 2022), and a reduction in the burden of chronic diseases (Dodd & Shields, 2005).

The health benefits, development of physical activity interventions and surveillance of physical activity levels are well documented in the general population but lacking for the population with disability (Martin Ginis et al., 2021). This study adds to the knowledge gap regarding reported physical activity levels in the northern population of individuals with intellectual disabilities. Further research on physical activity levels, benefits, and facilitators needs to be conducted to develop effective interventions and secure long-term changes in physical activity levels.

The analysis did not find any correlation between sedentary behaviour and mental health problems as measured by the MPAS or ABC-C. Previous research has shown a strong relationship between sedentary behaviour and impaired mental health (Hamer et al., 2014; Harris et al., 2018), arguing that sedentary behaviour causes reduced metabolic activity, which can lead to an increased risk of mental health problems. In addition, sedentary behaviour may hinder the development of social interactions and networks. The findings of the present study do not support those of previous studies, although mental health screening (MPAS) may have underestimated the social components of mental health.

4.1 | Strength and limitations

The current study had several limitations. First, the study does not include an objective physical activity measurement. In most studies

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TABLE 5 Binary logistic regression analyses of sedentary activity level as the dependent variable in association to barriers for participation in physical activity. Barriers significantly associated with sedentary/active in crosstab analysis were included. Results are shown unadjusted and with different combinations of adjusted variables.

Barriers and adjustment variables	*p*-Value for the barrier	Odds ratio Exp (B)	95% confidence intervals Exp (B)	Nagelkerke *R* squared
Cannot use public transport (*n* = 212)	**0.020**	2.06	1.12–3.77	0.04
Age, ID, and epilepsy	**0.031**	2.08	1.07–4.04	0.15
Age, ID, and Down syndrome	**0.046**	1.93	1.01–3.68	0.11
Age, ID and GMFCS	0.122	1.75	0.86–3.54	0.27
Easily tired (*n* = 212)	**0.023**	2.03	1.10–3.70	
Age, ID, and epilepsy	**0.036**	2.06	1.05–4.05	0.15
Age, ID, and Dows syndrome	**0.032**	2.06	1.06–3.98	0.11
Age, ID and GMFCS	0.203	1.59	0.78–3.23	0.26
Health related issues (including obesity) (*n* = 212)	**0.006**	2.42	1.29–4.51	0.05
Age, ID, and epilepsy	**0.018**	2.31	1.16–4.61	0.16
Age, ID, and Down syndrome	**0.015**	2.29	1.18–4.47	0.12
Age, ID and GMFCS	0.339	1.44	0.68–3.03	0.26
Severity of the intellectual disability (*n* = 212)	**0.003**	2.76	1.41–5.42	0.06
Age, ID, and epilepsy	**0.007**	2.94	1.34–6.48	0.17
Age, ID, and Down syndrome	**0.012**	2.72	1.25–5.90	0.12
Age, ID and GMFCS	**0.008**	3.13	1.35–7.25	0.29
No available activities at the day care centre (*n* = 212)	**0.003**	3.00	1.44–6.25	
Age, ID, and epilepsy	**0.008**	3.12	1.35–7.20	0.17
Age, ID, and Down syndrome	**0.018**	2.68	1.19–6.05	0.12
Age, ID and GMFCS	**0.011**	3.20	1.30–7.61	0.29
Wheelchair/mobility impairment (*n* = 212)	**<0.001**	17.52	6.43–47.76	0.27
Age, ID, and epilepsy	**<0.001**	15.65	5.52–44.42	0.33
Age, ID, and Down syndrome	**<0.001**	16.02	5.54–46.34	0.30
Age, ID and GMFCS	**0.002**	8.07	2.18–29.96	0.31

Abbreviation: ID, intellectual disability.

conducted on sedentary behaviour, recommendations for future research focus on obtaining precise estimates of sedentary behaviour and recognising specific groups in need of intervention. However, the current study employed a well-known questionnaire presented in an interview setting, also used in both previous studies in adults with intellectual disability (Olsen et al., 2021), and repeatedly in Norwegian population studies (Morseth & Hopstock, 2020). In the current study, physical activity and sedentary behaviour was not registered separately. Sedentary activity was defined as one out of four alternatives from a question about physical activity levels. Even so, the level of activity for each participant was investigated for both day activities and leisure activities. The likelihood of some of participants of being both active according to the definition (at least 4 h a week) and mainly sedentary is therefore small. There is a lack of evidence of physical activity behaviour in the intellectually disabled population, specifically in the Nordic region. Proxy-reported measures are more readily available and provide accurate information on physical activity behaviour when investigating whether individuals with intellectual disabilities are active or inactive (Dairo et al., 2017). Although more challenging (Michalsen et al., 2020), future population-based studies of adults with intellectual disability should aim to use objective methods in addition to proxy reports. Another possible limitation is the multiple comparisons without Bonferroni correction to control for the overall probability of a Type 1 error (false-positive result). However, this may not be an objection as the final analysis was a multivariate logistic regression analysis with adjustment for other possible predictors. Others argue that not adjusting for multiple comparisons is preferable (Rothman, 1990).

The study population was limited as it included a selected number of municipalities in the northern and middle regions of Norway. In the current study, the included participants were younger than the excluded participants and nonparticipants. This is due to a selection bias in the recruitment of participants. Thus, the study population is not representative of individuals with intellectual disabilities in the study region, and other barriers may be more relevant in older populations. Also, living conditions and the organisation of services varies

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between countries and future studies in other regions may yield different results.

A strength of this study is the community-based design. An additional strength is the availability of information on health conditions and levels of intellectual disability, with the possibility of adjusting for the association between barriers and activity levels.

5 | CONCLUSIONS

This study highlights various barriers to participation in physical activity among individuals with intellectual disabilities. Identifying these barriers is important to inform future health interventions for this population. Specifically, there is a growing need to enhance physical activity opportunities within day-activity centres, tailor programmes for wheelchair users, and improve access to physical activity facilities.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The dataset presented in this article is not readily available to protect the anonymity of the participants. Requests to access the datasets should be directed to the authors.

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