Received: 26 February 2021 | Revised: 7 June 2021 | Accepted: 18 July 2021

DOI: 10.1002/hsr2.342

RESEARCH ARTICLE

Health Science Reports Open Access WILEY

Unequal physical activity among children with cerebral palsy in Sweden—A national registry study

Frida Degerstedt[1,2] | Martin Björklund[1,3] | Britt-Inger Keisu[2,4] | Birgit Enberg[1]

[1]Department of Community Medicine and Rehabilitation, Physiotherapy, Umeå University, Umeå, Sweden

[2]Umeå Center for Gender Studies, Umeå University, Umeå, Sweden

[3]Centre for Musculoskeletal Research, Department of Occupational Health Sciences and Psychology, Faculty of Health and Occupational Studies, University of Gävle, Gävle, Sweden

[4]Department of Sociology, Umeå University, Umeå, Sweden

Correspondence
Frida Degerstedt, Department of Community Medicine and Rehabilitation, Physiotherapy, Umeå University, SE-901 87 Umeå, Sweden.
Email: frida.degerstedt@umu.se

Funding information
Linnéa och Josef Carlssons Stiftelse; Umea Center for Gender studies

Abstract

Aim: To examine the extent to which sex, country of birth, and functional aspects influence participation in physical education and physical leisure activity among children with cerebral palsy (CP) in Sweden.

Methods: This national cross-sectional registry study included children with CP aged 6 to 18 years who participated in the Swedish national quality registry, the Cerebral Palsy Follow-up Program, CPUP, in 2015. Comparisons and associations between sex, country of birth, and functional aspects and physical leisure/physical education were examined using chi-squared and multivariable logistic regression analysis.

Results: The study included 1935 children. Of them, 1625 (87%) reported participating in physical education and 989 (53%) reported participating in physical leisure activity. Children born in Sweden had higher odds of participating in physical education (OR: 1.99; 95% CI: 1.20-3.28) and physical leisure activity (OR: 2.51; 95% CI: 1.70-3.72) compared with children born outside Europe. Greater impairment of gross motor function was associated with lower participation levels. Boys participated slightly more frequently in leisure activities than girls.

Conclusion: Enhancing social inclusion with regard to disability, birth country, and sex are important and achievable goals for policymakers and practitioners for promoting participation in physical activity for children and adolescents with CP.

KEYWORDS
inequality, leisure, norms, physical education, youth

1 | INTRODUCTION

Children and youth with cerebral palsy (CP) do not achieve the levels of physical activity that among children in general are presumed to be needed for health, according to Bratteby et al.[1] Cerebral palsy is the most common cause of motor disability in children and youth,[2,3] with a male-to-female prevalence ratio of about 1.4:1.[4] Movement and posture disorders of CP are caused by nonprogressive disturbances in the immature brain and are commonly followed by disturbances of, for example, perception, cognition, and communication.[3] CP entails limitations in activity, commonly associated with restrictions in participation, in general, as well as in physical activity specifically.[5]

Physical activity has numerous well-established health benefits.[6,7] Achieving healthy levels of physical activity in childhood—meaning at least 60 minutes of daily, diverse physical activities[1,7,8]—is of particular significance, since it has been shown to increase the prerequisites for a lifelong healthy lifestyle.[9,10] However, children in Sweden and other countries generally do not achieve these levels of physical

activity[8] and children with CP even less so.[1,11] The lower participation of children with CP may be partly explained by low motor function and capacity, as earlier studies have shown.[12,13] However, that in turn could supposedly indicate insufficient adaptations in order for the children to be able to participate on their own terms, in physical leisure or physical education. The latter is by the United Nations established as a right for all children.[14]

Physical education and health is a school subject that makes an important contribution to children's total physical activity.[15] Physical education aims at providing the conditions to develop practical and theoretical knowledge of a variety of physical activities, outdoor life, and healthy lifestyles. As with all school subjects, in Sweden, participation is mandatory from age 6 until at least ninth grade.[16] Swedish schools are tasked with providing the same high-quality education to all children, regardless of background or personal and social circumstances, using compensatory measures.[16]

In addition to functionality, social factors may affect participation in physical activity for children with CP. Studies have shown that boys participate more in physical leisure activity than girls, at a greater intensity,[17-19] although one registry study found no differences with regard to sex in either leisure activity or physical education.[12] Among children in general, the Swedish school oversight agency shows that, to the contrary, girls seem to participate more than boys in physical education.[20] However, despite girls' higher participation, another study by Svennberg et al found that boys had higher odds of receiving better grades in physical education classes.[21] Girls, in general, report feeling pressure to perform in physical activity and express doubts about their abilities,[22] something that has been associated with gendered norms. Such norms commonly connect sports to masculine identity and an increase in the power of masculinity, while they do not correspondently enhance feminine identity.[23] Other social parameters were also associated with high grades, such as having highly educated parents and having lived in Sweden since before reaching school age.[21] Whether social categories, such as birth country, also affect children with CP's participation in physical education is not clear, nevertheless, of interest as a step towards providing equal prerequisites of participation in school for all children.

Because physical activity is a core contributor to health, and little research has been carried out on the association of social categories and participation in physical activity for children with CP in Sweden, we designed this study to examine the extent to which sex, country of birth, and aspects of functionality influence participation in physical education and physical leisure activity among children and teenagers with CP in Sweden.

2 | METHODS

This study is a national population-based study, with a cross-sectional design that used data from a Swedish national quality registry—the Cerebral Palsy Follow-up Program (CPUP).[24] The CPUP is a registry with a high degree of coverage and is used for clinical purposes as well as for research. The registry's initial aims were to prevent contractures and hip dislocations in children with CP through regular surveillance and assessments, and also to increase knowledge about CP and facilitate cooperation among healthcare professionals. All children in Sweden with diagnosed or presumed CP are offered regular, standardized assessments (usually annual) by a physiotherapist and occupational therapist. Around the age of four, a neuropediatric assessment is offered to confirm the diagnosis. Furthermore, psychological and speech pediatric assessments are also performed according to the CPUP.[24] This study included everyone aged 6 to 18 years living in Sweden who participated in the CPUP physiotherapy assessment in 2015. Here, we chose to refer to all participants as "children," despite the fact that some are 18 years of age.

The data for this study were accessed through the registry keeper in December 2016 and include information from the CPUP assessment forms filled out by a physiotherapist, occupational therapist, and pediatric neurologist. These forms include information from the physical examinations, as well as the children's and families' verbal reports to the recording professional regarding their perception of the child's situation during the time since their last CPUP assessment. For consistency and ease of reading, it will hereafter be indicated that information was reported by the child. In cases where multiple assessments were made during the year, this study used the first. In order to discuss which independent variables to include, an advisory reference group was consulted. The group consisted of persons having CP and healthcare professionals working with persons with CP. The four outcome variables used were collected from the physiotherapist's form and measure whether the child participated in physical education and physical leisure activities (yes/no), and if *yes*, how frequently (<1 time/week, 1-2 times/week, or 3-5 times/week). The response alternatives covering frequency were dichotomized into *frequent* or *infrequent physical education* and *frequent* or *infrequent physical leisure activity*, with *frequent* defined as ≥1 time/week (Figure 1). The reporting referring to leisure activity concerns all kinds of voluntary bodily movement resulting in an increase of energy expenditure performed in leisure time and hence includes varying exercise activities, gymnastics, sports, or outdoor activities.[24]

Table 1 summarizes the information on the demographics and characteristics of the children, which were used as independent variables. They are country of birth, sex, age, and the aspects of functionality; and gross motor function, cognitive level, manual ability, communication function, and pain. For all independent variables with missing values, a category called *not reported* was added. The variable *country of birth* included the alternatives (Sweden, Norway, Denmark, other), where Norway, Denmark, and countries listed under *other* were allocated to *Europe* (not Sweden) or *outside Europe*. The variable *sex* had two alternatives (boy/girl), and *age at examination* was included as a control. The aspects of functionality included gross motor function, measured with the Gross Motor Function Classification System—Expanded and Revised (GMFCS-E&R) levels I-V,[25] which is a predictive, five-level classification that focuses on the preferred manner of movement rather than capability. The system ranges from level I, which includes children who walk independently but with minor functional differences, through level V, which covers children

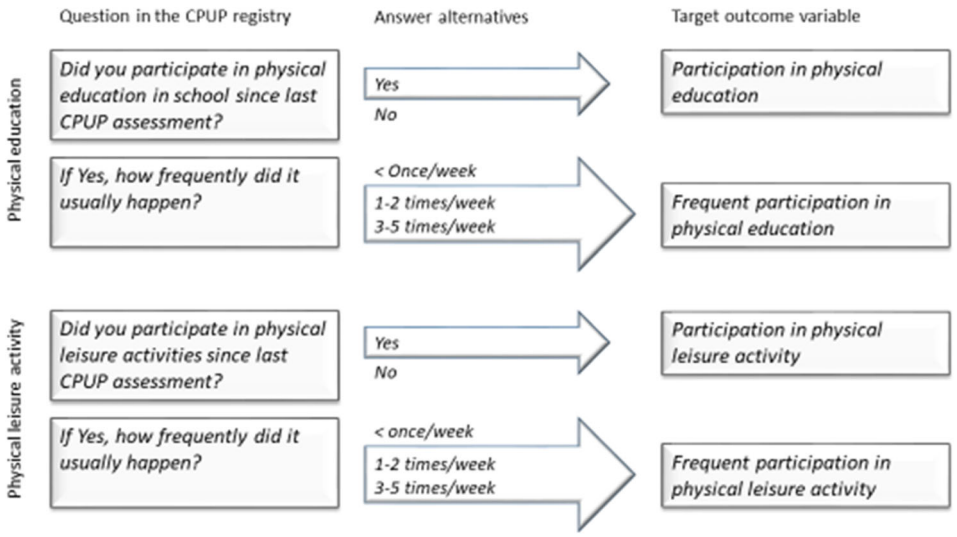

FIGURE 1 Transformation from questions of participation in, and frequency of, physical education and physical leisure activities in the CPUP physiotherapist form into the outcome variables

who are very limited in their control of movement and independent transportation.[25] Data on the cognitive level were reported according to the tenth version of the International Classification of Diseases and Related Health Problems (ICD-10).[26] The cognitive level was categorized into *intellectual disability*, including the categorical answers *severe/moderate intellectual disability* and *mild intellectual disability*, and the category *no intellectual disability*, which included *below average* and *average or higher*. The category *unknown/not assessed cognitive level* was merged with *not reported*. Manual ability was assessed with the Manual Ability Classification System (MACS), which is a five-level system that classifies typical manual performance in children with CP.[27] It ranges from level I, *Handles objects easily with good results*, through level V, *Does not handle objects*, including children who are very restricted in their ability to perform even simple tasks.[27] The Communication Function Classification System (CFCS) classifies children's ability to communicate in everyday life, ranging from level I, *Effective as a sender and receiver with familiar and unfamiliar partners*, through level V, *Seldom effective sender and receiver even with familiar partners*.[28] Lastly, a question of *pain* (yes/no) was also included as an aspect of functionality.

Participants in the CPUP registry have provided informed consent to participate in the registry, including sharing anonymized data for research. No additional consent from participants was required for using the registry data. This study's procedure followed the principles of the Declaration of Helsinki,[29] and the data have been presented such that no individual can be identified. The Regional Ethical Review Board at Umeå University approved the study (Reg. No. 2016/343-31).

2.1 | Data analysis

The registry data were analyzed using the program SPSS (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, version 25.0.). Spearman's rank correlation coefficient between independent variables was calculated to assess potential multicollinearity. Frequencies were reported with numbers and percentages. Univariate and multivariable logistic regressions were used to analyze associations between the independent variables and outcome variables. For the outcome variables in the regression analyses, an affirmative answer to *participation in physical education* and *participation in physical leisure activity*, as well as scoring *more than once a week* on the variables *frequent participation in physical education* and *frequent participation in physical leisure activity*, was coded as 1, and the remaining alternatives were coded as 0. The category *not reported* for missing values in the independent variables was intended to maintain data in the multivariable models. Only the independent variables that, in the univariate analyses, were significantly associated at the 10% level, with either of the two outcome variables for physical education or physical leisure activity respectively, were included in the multivariable analyses. The characteristics of children with missing values in the outcome variables were analyzed using the chi-squared test, and values significantly differing from those of the children with reported data were described. Associations were reported as odds ratio (OR) and 95% confidence interval (95% CI). *P* values <.05 were considered statistically significant.

3 | RESULTS

Multicollinearity analyses showed correlation coefficients below 0.5 between all variables, except for MACS and CFCS, which were highly correlated ($r_s = 0.8$).

Of the 1936 children who participated in the physiotherapeutic CPUP assessments, 807 were girls (42%). Of the children who reported country of birth, 231 (18%) were born outside Sweden, corresponding to 12% of the total group. Eighty-two children were born in Europe (not Sweden) (4%) and 149 outside Europe (8%) (Table 1). Most of the children born in Europe were born outside the Nordic countries (n = 72, 88%). Among those who reported their cognitive level, 373 children (39%) had an intellectual disability,

TABLE 1 Demographics and characteristics of children with CP aged 6 to 18 years, including name of the assessment form from which data were retrieved

Characteristics	N 1936	(%)	Assessment form
Sex			PTF
Boy	1120	(58)	
Girl	807	(41)	
Not reported	9	(1)	
Age			PTF
6-11	1121	(58)	
12-18	815	(42)	
Country of birth			PNF
Sweden	1175	(61)	
Europe	82	(4)	
Outside Europe	149	(8)	
Not reported	530	(27)	
GMFCS-E&R			PTF
Level I	726	(37)	
Level II	362	(19)	
Level III	171	(9)	
Level IV	321	(17)	
Level V	356	(18)	
MACS			OTF
Level I	387	(20)	
Level II	390	(20)	
Level III	228	(12)	
Level IV	184	(9)	
Level V	251	(13)	
Not reported	496	(26)	
CFCS			OTF
Level I	584	(30)	
Level II	178	(9)	
Level III	151	(8)	
Level IV	183	(9)	
Level V	224	(12)	
Not reported	963	(32)	
Cognitive level			PNF
ID	373	(19)	
Not ID	442	(23)	
Not assessed/reported	1121	(58)	
Pain			PTF
Yes	740	(38)	
No	1131	(59)	
Not reported	65	(3)	

Abbreviations: CFCS, Communication Function Classification System; GMFCS-E&R, Gross Motor Function Classification System—Expanded and Revised; ID, intellectual disability; MACS, Manual Ability Classification System; OTF, occupational therapist assessment form; PNF, pediatric neurologist assessment form; PTF, physiotherapist assessment form.

corresponding to 19% of the total. For further characteristics and information on assessment forms where data were collected, see Table 1.

3.1 | Physical education in school

Among the 1827 children reporting on the question of physical education, 1625 (87%) did participate (answered *yes*); of them, 1496 (92%) reported frequent participation. Multivariable analysis showed that children born in Sweden had 1.99 times higher odds of participating in physical education compared with children born outside Europe (95% CI: 1.20-3.28) (Table 2). Less impaired gross motor function was also associated with higher participation in physical education; compared to children with GMFCS level V, children with GMFCS level I had 23.76 times higher odds of participating in physical education (95% CI: 13.99-40.34) and 5.51 times higher odds of participating frequently (95% CI: 3.17-9.59) (Table 2). Children with a level II CFCS were significantly more likely to participate in physical education frequently compared with children with CFCS level V (OR: 3.01; 95% CI: 1.17-7.73) (Table 2). Sex, MACS, and pain showed no statistically significant association with physical education and were therefore removed from the final multivariable model.

3.2 | Physical leisure activity

There were 1864 (96%) children who reported whether they participated in physical leisure activity, of whom 989 (53%) did participate. Of the 919 children who also reported their frequency of participation, 753 (82%) engaged in frequent physical leisure activity. Children born in Sweden had 2.51 times higher odds of participating in leisure activities compared with children born outside Europe (95% CI: 1.70-3.72). Boys had 1.46 times higher odds of frequently participating in physical leisure activity compared with girls (95% CI: 1.02-2.07) (Table 3). Better gross motor function was associated with higher odds of participating in physical leisure activity: compared to children with GMFCS level V, children with GMFCS level I had 4.74 times higher odds of participating in physical leisure activity (95% CI: 3.48-6.46) and 3.65 times higher odds of participating frequently (95% CI: 2.06-6.48) (Table 3) and children without any intellectual disability had 1.83 times higher odds of participating compared with those who did have an intellectual disability (95% CI: 1.32-2.55) (Table 3). Because MACS and CFCS were not significantly associated with physical leisure activity, they were excluded from the model.

3.3 | Missing data analysis

Out of the total study population, 59 children (3%) did not report on physical education, and 72 (4%) did not report on physical leisure activity. The children with missing data on the outcome variables

TABLE 2 Odds ratios and 95% confidence intervals for univariate and multivariable logistic regressions for associations between participation in physical education and frequent physical education as outcome variables, and country of birth, cognitive level, GMFCS-E&R, and CFCS as independent variables, controlled for age

		Participation in physical education					Frequent participation in physical education				
			Univariate		Multivariable			Univariate		Multivariable	
	Tot n 1936	n	OR	95% CI	OR	95% CI	n	OR	95% CI	OR	95% CI
Missing in dependent		59					311				
Country of birth											
Outside Europe	149	144	1		1		112	1		1	
Europe	82	82	0.95	0.50-1.81	1.15	0.54-2.46	63	0.70	2.25-1.98	0.64	0.22-1.87
Sweden	1175	1142	**2.37**	**1.53-3.66**	**1.99**	**1.20-3.28**	1018	1.01	0.25-1.98	0.85	0.41-1.79
Not reported	530	509	**1.58**	**1.00-2.50**	1.24	0.71-2.14	432	1.09	0.51-2.36	1.13	0.50-2.53
Cognitive level											
ID	373	362	1		1		274	1		1	
No ID	442	433	**6.30**	**3.82-10.39**	1.46	0.83-2.58	412	1.78	0.98-3.23	0.85	0.44-1.65
Not reported	1121	1082	**2.11**	**1.57-2.84**	1.31	0.89-1.93	939	1.05	0.66-1.68	0.63	0.37-1.08
GMFCS-E&R											
Level V	356	343	1		1		197	1		1	
Level IV	321	307	**3.86**	**2.66-5.59**	**3.73**	**2.54-5.47**	257	1.63	0.97-2.72	1.63	0.96-2.78
Level III	171	163	**6.89**	**3.94-12.05**	**6.46**	**3.64-11.49**	146	**2.37**	**1.21-4.64**	**2.58**	**1.29-5.20**
Level II	362	353	**13.18**	**7.92-21.94**	**12.50**	**7.37-21.19**	334	**4.92**	**2.62-9.23**	**5.47**	**2.82-10.47**
Level I	726	711	**25.91**	**15.82-42.44**	**23.76**	**13.99-40.34**	691	**4.76**	**2.88-7.88**	**5.51**	**3.16-9.55**
CFCS											
Level V	224	218	1		1		190	1		1	
Level IV	183	176	0.85	0.48-1.51	0.72	0.37-1.37	148	1.80	0.85-3.81	1.59	0.74-3.45
Level III	151	151	0.62	0.35-1.09	0.68	0.35-1.29	122	1.62	0.58-2.29	1.49	0.67-3.31
Level II	178	169	0.74	0.42-1.31	0.60	0.32-1.14	141	**3.25**	**1.29-8.19**	**3.01**	**1.17-7.73**
Level I	584	567	1.06	0.67-1.70	0.75	0.44-1.27	497	1.57	0.92-2.67	1.28	0.74-2.22
Not reported	616	596	1.07	0.67-1.71	0.89	0.53-1.49	527	**1.97**	**1.14-3.40**	1.69	0.96-2.97

Note: Significant results written in bold.

Abbreviations: CFCS, Communication Function Classification System; GMFCS-E&R, Gross Motor Function Classification System—Expanded and Revised; ID, intellectual disability.

(nonresponders) were compared with those who did respond, finding that the proportion of children aged 6-11 was higher among nonresponders on the physical education variable (44 children, 75%) versus responders (1077, 57%, $P = .008$), and on the physical leisure variable (53, 74%) versus responders (1068, 57%, $P = .007$).

4 | DISCUSSION

The current study shows differences in the participation in physical education and physical leisure activity among children with CP in Sweden. Children born in Sweden had higher odds of participating in both physical education and physical leisure activities compared with children born outside Europe, and boys participated more frequently in physical leisure activities than girls. With respect to the aspects of functionality, the GMFCS-E&R, in particular, was associated with physical education and physical leisure activity, with better gross motor function corresponding to more activity. Having CFCS level II was associated with higher odds of participating in physical education compared with level V, and having intellectual disability entailed lower odds of participating in physical leisure compared with those not having intellectual disability. Earlier studies identified environmental barriers to physical leisure activity besides physical availability, such as parental or trainer hesitation, as well as social attitudes and acceptance by peers and the child him- or herself as limitations to participation in leisure activities.[30,31] The current study finds that country of birth, sex, and severity of impairment all play a role in this multifaceted phenomenon.

4.1 | Country of birth

Children born outside Europe were underrepresented in physical education and physical leisure activity compared with children born in Sweden. The reasons for immigration, its degree of voluntariness, and

TABLE 3 Odds ratios and 95% confidence intervals for univariate and multivariable logistic regressions for associations between *Participation in physical leisure activity* and *Frequent physical leisure activity* as outcome variables, and *sex*, *country of birth*, *cognitive level*, *GMFCS-E&R*, and *pain*, controlled for age

		Participation in physical leisure activity YES					Frequent physical leisure Activity				
			Univariate		Multivariable			Univariate		Multivariable	
	Tot n 1936	n	OR	95% CI	OR	95% CI	n	OR	95% CI	OR	95% CI
Missing in dependent		72					1017				
Sex											
Girls	807	777	1		1		374	1		1	
Boys	1120	1079	1.04	0.87-1.25	0.97	0.80-1.19	544	**1.58**	**1.13-2.22**	**1.46**	**1.02-2.07**
Not reported	9	8	0.13	0.02-1.05	0.19	0.02-1.59	1	0.00	0.00	0.00	0.00
Country of birth											
Outside Europe	149	140	1		1		46	1		1	
Europe	82	82	1.38	0.78-2.42	1.57	0.86-2.88	28	1.29	0.43-3.96	1.08	0.34-3.49
Sweden	1175	1136	**2.84**	**1.96-4.26**	**2.51**	**1.70-3.72**	623	1.59	0.80-3.317	1.35	0.66-2.76
Not reported	530	506	**1.98**	**1.34-2.93**	**1.83**	**1.20-2.81**	222	1.89	0.89-3.99	1.53	0.68-3.43
Cognitive level											
ID	373	354	1		1		126	1		1	
No ID	442	431	**3.56**	**2.62-4.72**	**1.83**	**1.32-2.55**	282	**2.42**	**1.45-4.04**	1.45	0.82-2.56
Not reported	1121	1079	**1.71**	**1.34-2.19**	1.30	0.97-1.74	511	**1.87**	**1.20-2.93**	1.29	0.77-2.18
GMFCS-E&R											
Level V	356	342	1		1		85	1		1	
Level IV	321	307	**2.16**	**1.56-3.00**	**1.99**	**1.42-2.77**	128	1.65	0.91-2.99	1.58	0.86-2.90
Level III	171	161	**3.28**	**2.21-4.84**	**2.96**	**1.97-4.43**	80	**2.66**	**1.48-4.76**	1.97	0.96-4.04
Level II	362	352	**3.22**	**2.35-4.43**	**2.80**	**2.01-3.90**	180	**2.13**	**1.06-4.26**	**2.45**	**1.33-4.52**
Level I	726	702	**5.95**	**4.47-7.94**	**4.74**	**3.48-6.46**	446	**4.26**	**2.51-7.21**	**3.65**	**2.06-6.48**
Pain											
Yes	740	727	1		1		352	1		1	
No	1131	1091	1.09	0.90-1.31	1.05	0.86-1.29	547	**1.50**	**1.07-2.11**	1.41	0.99-2.02
Not reported	65	46	1.46	0.79-2.69	1.58	0.83-3.02	20	1.59	0.45-5.56	1.83	0.50-6.65

Note: Significant results written in bold.
Abbreviations: GMFCS-E&R, Gross Motor Function Classification System—Expanded and Revised; ID, intellectual disability.

the reception received from the host country are more likely to be the cause of differing levels of integration, as found by Vogel et al, rather than distance per se.[32] Integration in turn may also play a part in participation in physical activity. However, the current study does not have the data needed to analyze this point. Regardless of the cause of immigration, schools' mandate to compensate for children's background is valid but does not seem to be effectively accomplished.[16] Moreover, children who are born outside Sweden are more likely to live in families facing socioeconomic challenges such as low educational attainment and low income,[32,33] and these factors may also affect participation in leisure activities for children with CP.

4.2 | Sex and gender

Our results showed equal participation between the sexes in physical education, while boys had slightly higher odds of frequent participation in physical leisure activity than girls. The latter points in similar direction as earlier studies, showing that gender affects choice of activities; the boys are more prone to choose physical and team-based activities, whereas girls tend to be more active in recreational and social activities.[17-19] While school activities such as physical education are governed by regulations,[16] leisure time may be more influenced by social norms regarding gender, such as connecting sports and physical activity to masculine identities rather than feminine ones.[23,34] As the data in the current study do not analyze the type of activities, a more thorough analysis of physical activity with regard to gender is not possible to perform.

4.3 | Functionality and disability

Greater impairment of gross motor function was associated with lower participation in both physical education and physical leisure

activities, as has been reported elsewhere.[12] This finding is also in accordance with a review that concluded that physical capacity is strongly associated with habitual physical activity.[13] Lauruschkus et al[12] further showed that children with GMFCS levels IV and V participated in a narrow range of activities (mainly horseback riding and swimming). A limited range of available activities result in disadvantages, both from barriers to health-promoting physical activity and from limited access to the crucial social interactions associated with leisure activity. Moreover, normativity within sports is not only associated with gender but extols a male, nondisabled, and slender body and can thereby position girls/women and persons with disabled bodies as deviant.[35] Altogether, these factors do not encourage participation for children with CP, in particular those with severe disabilities. The manual and communication function measures, MACS and CFCS, were included in our analyses after discussions with the advisory reference group. Nevertheless, levels of MACS showed neither significant nor borderline associations with physical education or leisure, which is in accordance with earlier studies.[12] In contrast, the significant association of CFCS to participation support that communication function does play a role in the participation in physical education. However, to confirm the results, and to elucidate detailing about the association related to the grade of communication impairment, further studies are needed. Having an intellectual disability was associated with lower participation in physical leisure activity, which is in line with an earlier multinational study.[36] Conceivably, this may derive from the additional stigma reported by Jahoda et al[37] to be associated with intellectual disabilities, thus creating inequity and discrimination towards this group. However, such conclusions cannot be drawn based on the current results.

Schools' insufficient compensatory measures for children's functionality are, as with compensation for birth country, problematic,[16] especially since children with severe disabilities commonly attend special adaptive schools in Sweden. These schools should be equipped to provide adequate participation in activities that also allow social inclusion with other students, rather than specifically designed individual activities, as earlier highlighted by adolescents with disabilities.[38]

The results of this study indicate that the Swedish government has not achieved its 2010 target of full availability per the United Nations Convention on the Rights of Persons with Disabilities,[39] when it comes to physical education and leisure activities. Moreover, during the last decade, the Swedish Law on Support and Service for Persons with Certain Functional Impairments (LSS) has become more strictly enforced, leading to restrictions in aid for persons with disabilities.[40] This, together with the rare provision of technical aids needed specifically for leisure activities, by the Swedish county councils, means that children with severe impairments are dependent on the time, energy, and financial resources of their individual families in order to engage in leisure activities.

4.4 | Strengths and limitations

The current study provides valuable information on the distribution of physical activity, on social belongings among children with CP. However, by doing this, we have also grouped together persons who, in several aspects, may have as many differences among them as commonalities. Knowledge on the interaction between social belongings, and how they reinforce privileged or disadvantaged positions in society in relation to physical education and leisure activity, remains limited. Nevertheless, our results do reveal inequity that may entail greater disadvantages for certain children with CP than for others. In order to capture such experiences of children with CP, future studies should include in-depth interviews and intersectional analyses. Children in the current study are heterogeneous regardless if they are born in Sweden or not. They have backgrounds that reflect a variety of customs, cultures, financial conditions, religions, and ability to absorb education. Future studies may therefore benefit from further subgrouping.

The data used in the current study do not reveal whether children achieve healthy levels of physical activity. The reports in the CPUP registry refer to the children's reported participation since their last assessment, usually the previous year. This form of reporting physical activity is clinically suitable to large populations, but its validity may be questioned and may suffer from recall bias.[41]

The children with missing values on our outcome variables were, on average, younger; however, because of the low proportion of missing values (3%-4%), and the limited association between age and physical activity, we do not believe that this affected the results. Some children aged 16 to 18 years were assessed using the CPUP adult assessment form and thus were not included in the current study. Because pain increases with age,[42] pain prevalence in our study may thereby be underestimated for the population of children with CP.

In conclusion, the current study shows that there is inequity among children and adolescents with CP in Sweden with regard to participation in physical leisure activity and physical education, despite regulations to prevent such inequity. It is important to improve social inclusion in a way that considers levels of disability and birth country, and this ought to be an achievable step for policymakers and practitioners in promoting participation in physical activity for children and adolescents with CP.

ACKNOWLEDGMENT

The authors would like to acknowledge the participants in the advisory reference group, who contributed with valuable insights and support during the project, the National Quality Registry, CPUP, which provided the data for this study, and the children, families, and professionals who contributed to making this possible.

CONFLICT OF INTEREST

The authors declare no conflicts of interest that could be perceived as prejudicing the impartiality of the research reported.

AUTHOR CONTRIBUTIONS

Conceptualization: Frida Degerstedt
Formal Analysis: Frida Degerstedt
Funding Acquisition: Martin Björklund, Britt-Inger Keisu, Birgit Enberg
Methodology: Frida Degerstedt, Martin Björklund, Birgit Enberg

Project Administration: Frida Degerstedt, Martin Björklund, Birgit Enberg

Resources: Britt-Inger Keisu

Supervision: Martin Björklund, Britt-Inger Keisu, Birgit Enberg

Writing-Original Draft: Frida Degerstedt

Writing-Review Editing: Frida Degerstedt, Martin Björklund, Britt-Inger Keisu, Birgit Enberg

All authors read and approved the final manuscript.

Frida Degerstedt, Martin Björklund and Birgit Enberg had full access to all the data in this study and take complete responsibility for the integrity of the data and the accuracy of the data analysis.

FUNDING INFORMATION

This research was supported by Umeå Center for Gender Studies, Umeå University, and the Linnea and Josef Carlsson Foundation.

TRANSPARENCY STATEMENT

The first author confirms that the manuscript is an honest, accurate, and transparent account of the study being reported, that no important aspects of the study have been omitted, and that any discrepancies from the study as planned have been explained.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the Cerebral Palsy Follow-Up Program (CPUP) in Sweden. Restrictions apply to the availability of these data, which were used under license for this study. Data are available from the first author with the permission of CPUP. Instructions on how to obtain a license can be obtained from the CPUP.

ORCID

Frida Degerstedt https://orcid.org/0000-0002-1553-8634
Martin Björklund https://orcid.org/0000-0001-7543-4397
Britt-Inger Keisu https://orcid.org/0000-0002-9627-4625

REFERENCES

1. Bratteby Tollerz LU, Forslund AH, Olsson RM, et al. Children with cerebral palsy do not achieve healthy physical activity levels. *Acta Paediatr*. 2015;104:1125-1129. https://doi.org/10.1111/apa.13141
2. SCPE. Surveillance of cerebral palsy in Europe: a collaboration of cerebral palsy surveys and registers. Surveillance of Cerebral Palsy in Europe (SCPE). *Dev Med Child Neurol*. 2000;42:816-824.
3. Rosenbaum P, Paneth N, Leviton A, et al. A report: the definition and classification of cerebral palsy April 2006. *Dev Med Child Neurol Suppl*. 2007;109:8-14.
4. Chounti A, Hägglund G, Wagner P, Westbom L. Sex differences in cerebral palsy incidence and functional ability: a total population study. *Acta Paediatr*. 2013;102:712-717. https://doi.org/10.1111/apa.12240
5. Mutlu A, Büğüşan S, Kara ÖK. Impairments, activity limitations, and participation restrictions of the international classification of functioning, disability, and health model in children with ambulatory cerebral palsy. *Saudi Med J*. 2017;38:176-185. https://doi.org/10.15537/smj.2017.2.16079
6. Lee IM, Shiroma EJ, Lobelo F, et al. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet*. 2012;380:219-229. https://doi.org/10.1016/S0140-6736(12)61031-9
7. WHO. *Global Recommendations on Physical Activity for Health*. Geneva: World Health Organization; 2010.
8. Axelsen M, Danielsson M, Norberg M, Sjoberg A. Eating habits and physical activity: Health in Sweden: The National Public Health Report 2012. Chapter 8. *Scand J Public Health*. 2012;40:164-175. https://doi.org/10.1177/1403494812459473
9. Waltersson L, Rodby-Bousquet E. Physical activity in adolescents and young adults with cerebral palsy. *Biomed Res Int*. 2017;2017:6. https://doi.org/10.1155/2017/8080473
10. Rovio SP, Yang X, Kankaanpää A, et al. Longitudinal physical activity trajectories from childhood to adulthood and their determinants: the Young Finns Study. *Scand J Med Sci Sports*. 2018;28:1073-1083. https://doi.org/10.1111/sms.12988
11. Carlon SL, Taylor NF, Dodd KJ, Shields N. Differences in habitual physical activity levels of young people with cerebral palsy and their typically developing peers: a systematic review. *Disabil Rehabil*. 2013;35:647-655. https://doi.org/10.3109/09638288.2012.715721
12. Lauruschkus K, Westbom L, Hallström I, et al. Physical activity in a total population of children and adolescents with cerebral palsy. *Res Dev Disabil*. 2013;34:157-167. https://doi.org/10.1016/j.ridd.2012.07.005
13. Keawutan P, Bell K, Davies PS, et al. Systematic review of the relationship between habitual physical activity and motor capacity in children with cerebral palsy. *Res Dev Disabil*. 2014;35:1301-1309. https://doi.org/10.1016/j.ridd.2014.03.028
14. Socialdepartementet. *FN:s konvention om rättigheter för personer med funktionsnedsättning*. In: Socialdepartementet, (ed.). Stockholm: Regeringskansliet, 2008.
15. Fröberg A, Raustorp A, Pagels P, Larsson C, Boldemann C. Levels of physical activity during physical education lessons in Sweden. *Acta Paediatr*. 2017;106:135-141. https://doi.org/10.1111/apa.13551
16. Swedish National Agency for Education [Skolverket]. This is the Swedish national agency for education; 2020. Available from https://www.skolverket.se/andra-sprak-other-languages/english-engelska#h-MoreinformationinEnglish. Accessed September 8, 2020.
17. Shikako-Thomas K, Majnemer A, Law M, Lach L. Determinants of participation in leisure activities in children and youth with cerebral palsy: systematic review. *Phys Occup Ther Pediatr*. 2008;28:155-169. https://doi.org/10.1080/01942630802031834
18. Ullenhag A, Krumlinde-Sundholm L, Granlund M, et al. Differences in patterns of participation in leisure activities in Swedish children with and without disabilities. *Disabil Rehabil*. 2014;36:464-471. https://doi.org/10.3109/09638288.2013.798360
19. Degerstedt F, Wiklund M, Enberg B. Physiotherapeutic interventions and physical activity for children in Northern Sweden with cerebral palsy: a register study from equity and gender perspectives. *Glob Health Action*. 2017;10:1272236. https://doi.org/10.1080/16549716.2017.1272236
20. Ssi S. *Kvalitetsgranskning av ämnet idrott och hälsa i årskurs 7-9 [Quality review of the subject physical education and health in grades 7-9 in Sweden]*. Stockholm: Skolinspektionen; 2018.
21. Svennberg L, Högberg H. Who gains? Sociological parameters for obtaining high grades in physical education. *Nordic J Stud Educ Pol*. 2018;4:48-60. https://doi.org/10.1080/20020317.2018.1440112
22. Corr M, McSharry J, Murtagh EM. Adolescent girls' perceptions of physical activity: a systematic review of qualitative studies. *Am J Health Promot*. 2018;33:806-819. https://doi.org/10.1177/0890117118818747
23. Metcalfe S. Adolescent constructions of gendered identities: the role of sport and (physical) education. *Sport Educ Soc*. 2018;23:681-693. https://doi.org/10.1080/13573322.2018.1493574
24. CPUP. CPUP-Cerebral palsy follow-up program and National Quality Registry; 2019. Available from http://cpup.se/wp-content/uploads/2019/01/FT-manual-2019.pdf, http://cpup.se/wp-content/uploads/2016/11/Årsrapport-160926-1.pdf. Accessed January 25, 2019.
25. Palisano RJ, Rosenbaum P, Bartlett D, et al. Content validity of the expanded and revised Gross Motor Function Classification System.

Dev Med Child Neurol. 2008;50:744-750. https://doi.org/10.1111/j.1469-8749.2008.03089.x
26. WHO. In: World Health Organization, ed. *International statistical classification of diseases and related health problems, tenth revision (ICD-10, Version:2019)*. Geneva: World Health Organization; 2019.
27. Eliasson AC, Krumlinde-Sundholm L, Rosblad B, et al. The Manual Ability Classification System (MACS) for children with cerebral palsy: scale development and evidence of validity and reliability. *Dev Med Child Neurol*. 2006;48:549-554. https://doi.org/10.1017/s0012162206001162
28. Hidecker MJ, Paneth N, Rosenbaum PL, et al. Developing and validating the Communication Function Classification System for individuals with cerebral palsy. *Dev Med Child Neurol*. 2011;53:704-710. https://doi.org/10.1111/j.1469-8749.2011.03996.x
29. World Medical Association. WMA's declaration of Helsinki serves as guide to physicians. *JAMA*. 1964;189:33-34. https://doi.org/10.1001/jama.1964.03070130073046
30. Imms C. Children with cerebral palsy participate: a review of the literature. *Disabil Rehabil*. 2008;30:1867-1884. https://doi.org/10.1080/09638280701673542
31. Verschuren O, Wiart L, Hermans D, et al. Identification of facilitators and barriers to physical activity in children and adolescents with cerebral palsy. *J Pediatr*. 2012;161:488-494. https://doi.org/10.1016/j.jpeds.2012.02.042
32. Vogel Joachim HM. Invandrarnas välfärd och hälsa. Diskriminering och integration på 90-talet. [Immigrants' health and welfare. Discrimination and integration in the 1990th]. *Socialmedicinsk tidskrift*. 2003;1:19-30.
33. SCB [Statistics Sweden]. *Living conditions for children with foreign background [Uppväxtförhållanden för barn med utländsk bakgrund]*. Stockholm: SCB; 2019.
34. Spencer RA, Rehman L, Kirk SFL. Understanding gender norms, nutrition, and physical activity in adolescent girls: a scoping review. *Int J Behav Nutr Phys Act*. 2015;12:6-6. https://doi.org/10.1186/s12966-015-0166-8
35. Apelmo E. 'You do it in your own particular way.' Physical education, gender and (dis)ability. *Sport Educ Soc*. 2019;24(7):702-713. https://doi.org/10.1080/13573322.2018.1452198
36. Michelsen SI, Flachs EM, Damsgaard MT, et al. European study of frequency of participation of adolescents with and without cerebral palsy. *Eur J Paediatr Neurol*. 2014;18:282-294. https://doi.org/10.1016/j.ejpn.2013.12.003
37. Jahoda A, Markova I. Coping with social stigma: people with intellectual disabilities moving from institutions and family home. *J Intellect Disabil Res*. 2004;48:719-729. https://doi.org/10.1111/j.1365-2788.2003.00561.x
38. Wickman K. Experiences and Perceptions of Young Adults with Physical Disabilities on Sports. *Social Incl*. 2015;3:12. https://doi.org/10.17645/si.v3i3.158
39. Regerinskansliet. In: Affairs SMoHaS, ed. *FN:s konvention om rättigheter för personer med funktionsnedsättning [The United Nations Convention on the Rights of Persons with Disabilities (CRPD)]*. Stockholm: Edita Sverige AB; 2008:232.
40. The Swedish Social Insurance Inspectorate. In: socialförsäkringen TSSIIIf, ed. *Health care measures and personal care assistance Report 2016:16 [Sjukvårdande insatser och personlig assistans]*. Stockholm: Elanders Sverige AB; 2016:82.
41. Mitchell LE, Ziviani J, Oftedal S, et al. A systematic review of the clinimetric properties of measures of habitual physical activity in primary school aged children with cerebral palsy. *Res Dev Disabil*. 2013;34:2419-2432. https://doi.org/10.1016/j.ridd.2013.04.013
42. Eriksson E, Hägglund G, Alriksson-Schmidt AI. Pain in children and adolescents with cerebral palsy - a cross-sectional register study of 3545 individuals. *BMC Neurol*. 2020;20:15-15. https://doi.org/10.1186/s12883-019-1597-7

How to cite this article: Degerstedt F, Björklund M, Keisu B-I, Enberg B. Unequal physical activity among children with cerebral palsy in Sweden—A national registry study. *Health Sci Rep*. 2021;4:e342. https://doi.org/10.1002/hsr2.342