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## REVIEW ARTICLE

# The effect of the environment on participation of children and youth with disabilities: a scoping review

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## Abstract

**Objective:** The study's purpose was to identify and synthesize research evidence regarding the effect of the environment on community participation of children with disabilities. **Methods:** A scoping review of peer-reviewed studies published from 1990 to 2011 was performed. Two independent reviewers selected studies based on a systematic procedure. Inclusion criteria for studies were: participants with a disability, aged 5–21 years, whose environment was examined in relation to participation in out-of-school activities. Data were organized and synthesized based on environmental domains within the International Classification of Functioning, Disability and Health (ICF): Natural Environment/Products and Technology; Support and Relationships; Attitudes; and Services, Systems and Policies. **Results:** Searching identified 1232 articles and 31 met the inclusion criteria. Each domain of the environment within the ICF influenced participation as a facilitator and/or barrier. The most common facilitators involved social support of family and friends and geographic location. The most common barriers included attitudes, physical environment, transportation, policies and the lack of support from staff and service providers. **Conclusions:** Knowledge derived from this review can assist practitioners in addressing the specific environmental domains that influence children's participation. Such awareness can also foster new research questions and assist policy makers in identifying the factors influencing participation.

## Keywords

Childhood disability, community, environmental characteristics, leisure, participation

## History

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## ► Implications for Rehabilitation

- All domains of the environment, suggested by the ICF, have an influence on children's participation.
- Evidence regarding the effect of the environment on participation is focused primarily on children with *physical* disabilities; more studies are needed involving various health conditions and age groups.
- Practitioners and decision-makers can focus attention on specific aspects of the environment, e.g. attitudinal challenges and social support, in order to foster inclusion and participation-based communities.

## Introduction

Participation, defined as “involvement in a life situation”, is recognized as an important outcome of rehabilitation interventions [1] and as a human right [2]. Existing evidence shows that participation in community-based leisure activities (e.g. organized sport, youth clubs) contributes to the development and quality of life and promotes health for children [3,4]. Despite these benefits, there is accumulating evidence indicating that participation of children and youth with disabilities is often restricted [5–7] in

comparison to their typically developing peers. One of the reasons for this pattern is related to barriers or supports within their environment.

Ecological-based models of childhood development [8] and the biopsychosocial-based International Classification of Functioning, Disability and Health framework (ICF) [9] identify the environment as a key factor influencing participation. Aligned with the ICF, a conceptual model of leisure participation of children with disabilities highlights the physical, social, attitudinal and institutional environments as key factors contributing to children's participation [10]. In many situations, particularly those involving persistent chronic conditions, change in a child's environment is more feasible in comparison to change in a child's abilities/body functions. The potential therapeutic role of the environment in promoting participation is illustrated by

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Table 1. Examples of search terms.

Environment	Participation	Disability	Age range
“Environment”, “community”, “neighborhood”, “social environment”, “social integration”, “built environment”, “access”, “attitudes”, “culture”, “context”	“Participation”, “human activity”, “leisure”, “recreation”, “out-of-school activities”, “extra-curricular activities”, “activity”, “play”	“Disability”, “child health care”, “developmental disease”, “disabled children”, 44 Disorders searched as keywords (Appendix)	“Pediatrics”, “child”, “adolescence”, “youth”, “young adults”

emerging environment-based approaches such as *context therapy* [11]. Thus, knowledge related to the effect of the environment on participation can contribute to the development of intervention plans and strategies, which can then be evaluated.

Very few syntheses of evidence on studies of participation in children have been conducted; moreover, these reviews included a broad range of factors with no in-depth exploration of the role of the environment in childhood participation and focused primarily on children with cerebral palsy [12,13]. A synthesis of evidence specific to environmental factors that affect participation of children and youth with various types of disabilities is needed. A summary of the existing evidence about environmental barriers and supports to childhood participation is of interest to stakeholders, such as practitioners, researchers and policy makers, who target modifiable factors that are socially and ecologically based. Moreover, a review will identify gaps in the literature and, consequently, guide more focused lines of inquiry. The purpose of this scoping review of the literature is to map the breadth and nature and summarize the results of evidence related to the association between environment and participation for children and youth with disabilities, with a focus on ascertaining the key environmental supports and barriers of participation.

## Methods

A scoping review of the literature was appropriate to meet the objectives of this study. Scoping reviews follow a systematic and rigorous procedure [14]. They typically have broad, comprehensive objectives, compared to systematic reviews, which are often guided by more narrow, focused research questions [15].

The scoping review addressed the following question: *What is known from the literature about the impact of the environment on participation in out-of-school activities of children and youth with disabilities?* The review comprised of the following steps as recommended by Arksey and O'Malley [15]:

- (1) Systematic search: The authors searched electronic database including CINAHL, MEDLINE, Social Science Citation Index (SSCI), Geobase and Embase as well as Measures for articles published between 1990 and 2011. Initial keywords were broad to capture the salient concepts of participation, the environment, childhood disability and age range (Table 1). Prominent measures of participation and environment used in pediatric rehabilitation were also searched. Subject headings were defined and adapted for each database, allowing a more sensitive search of the literature, and consequently, broader results. Reference lists of selected articles were also reviewed for novel studies. See Table 1 and Appendix for search terms.
- (2) Selection of studies: Peer-reviewed studies, regardless of their design, met the inclusion criteria if they focused on (1) children, youth and young adults with any type of disability and with an age range between 5 and 21 (based on the median), (2) participation in activities outside of school and (3) the influence of any aspect of the environment on participation. Studies were excluded if they focused on

participation in work and/or school activities or were theoretical/descriptive in nature. Two reviewers independently selected articles and any disagreement was resolved by discussion.

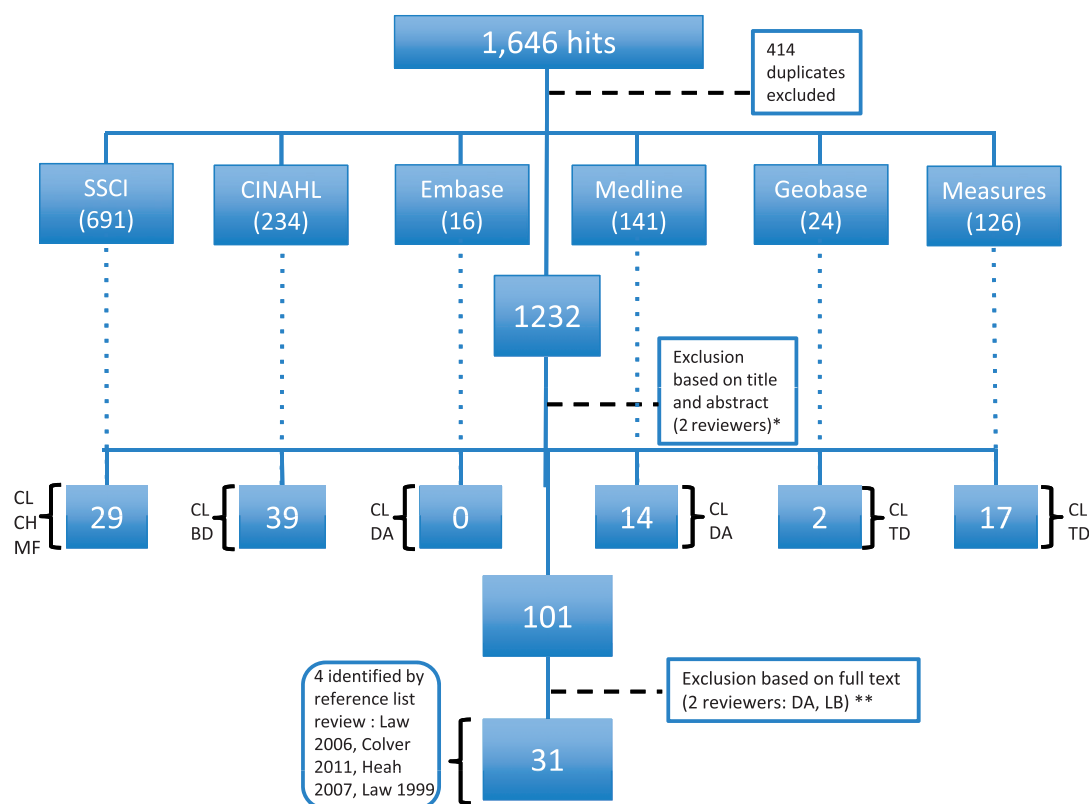
- (3) Charting the data: Data were extracted from the articles regarding study location, design, population, environmental domains covered, participation and environment measures used and study results regarding the impact of the environment on participation. Data were organized based on five environmental domains of the ICF [9]: Natural Environment (e.g. residency, climate, landforms); Products and Technology (e.g. accessibility of buildings); Support and Relationships (e.g. parental involvement); Attitudes (e.g. perception towards disability); and Services, Systems and Policies (e.g. community programs). Products and Technology and Natural Environment were merged into a single category because these concepts were often assessed together within the studies. For example, assessment of accessibility often included the presence of lifts (products and technology) and landforms (natural environment).
- (4) Summarizing the results: Authors collectively compared and discussed the charted data. Descriptive statistics were performed to characterize the research literature and to identify the breadth and gaps. The study results were examined and discussed to determine trends. Supports and barriers were identified and examined across each ICF environmental domain to form an integrated summary of the evidence. Consensus regarding the themes/key items of information generated from the review was reached.

## Results

The initial search revealed 1646 articles with 414 duplicates resulting in 1232 distinct potential articles. The articles were first screened by two reviewers; 1131 articles were excluded (Figure 1). Of these, 13% addressed adult populations, 6% addressed infant or preschool populations, 6% were theoretical/educational and 75% did not address participation and environments together. If there was any uncertainty regarding whether an article examined participation and environments, it remained in the article pool. The article titles, abstracts and full text (as needed) were then reviewed. Thirty-one of the identified articles met the inclusion criteria. The primary reasons for excluding articles were that the environment was not examined in relation to participation (40% of the articles), and “non-study” articles, for example, discussion or program/measure development (20%).

## Types of research

The selected studies were published between 1999 and 2011 (median 2007). The majority of the studies were quantitative ( $n=17$ ; 55%) followed by qualitative ( $n=10$ ; 32%), review



\* exclusion: 75% did not address participation/environments, 13% adult populations, 6% infant/preschool, 6% theoretical/education

\*\*exclusion: non-study articles (20%)/environment related to participation not examined (40%)

Figure 1. Flowchart of study selection process.

( $n=3$ ) and 1 mixed-methods study. Qualitative studies were evident in the early stages of research (70% of qualitative work were completed between 1999 and 2007) followed by quantitative work later on (more than half of quantitative studies were done after 2007). Table 2 summarizes the study's characteristics.

### Types of disabilities included in environmental research

More than half of the studies ( $n=17$ ) examined children with cerebral palsy (CP), followed by physical disabilities ( $n=6$ ), acquired brain injury (ABI;  $n=3$ ), autism ( $n=3$ ) and Down syndrome ( $n=2$ ). Physical disability in these studies referred to a condition in which mobility was restricted due to neurological-based and musculoskeletal disorders. The study population age range fell most frequently between 6 and 14 years old. In terms of environmental factors, *Services, Systems and Policies* and *Product and Technology/Natural Environment* are the domains that were examined most often, in 19 and 18 of the studies respectively, as compared to 17 for *Supports and Relationships* and 16 for *Attitudes*. Finally, studies were most often completed in Canada, Europe and the USA.

One study did not explicitly examine the influence of the environment on participation [16] but was included because it further examined the specific environmental features within the same regions studied by Fauconnier et al. [17]. Two further studies reported on the same sample but different results and differing levels of detail [18,19].

### Types of measures used

The most frequent measures of participation included the Children's Assessment of Participation and Enjoyment/Preferences for Activities of Children (CAPE/PAC) [20],

Canadian Occupational Performance Measure (COPM) [21], Child and Adolescent Scale of Participation (CASP) [22], Lifestyle Assessment Questionnaire (LAQ) [23] and LIFE-Habits [24]. Measures of the environment were both general, for example, Craig Hospital Inventory of Environmental Factors (CHIEF) [25], Child and Adolescent Scale of Environment (CASE) [26], European Child Environment Questionnaire (ECEQ) [16], and specific, for example, Family Environment Scale (FES) [27], Impact on Family Scale (IOF) [28] Parenting Stress Index (PSI) [29] and Social Support Scale for Children (SSSC) [30]. Table 3 provides a brief description of each measure.

### Evidence related to the effect of Products and Technology/Natural Environment on participation

#### Supports

Supports were observed in 46% of the examined studies within this environmental domain. An extensive project, led by the SPARCLE group, showed that participation of children with CP varies across geographic locations in Europe [17,31–33]. Colver et al. [16] further examined the environmental barriers of the regions studied by Fauconnier et al. [17] and found that the accessibility of the physical environment, as measured by the ECEQ and including adapted toilets, ramps, lifts, aids, parking and public transportation, also varied across regions. Specific districts (e.g. Northern England, Northern Ireland and Denmark) that were found to be the most accessible regions [16] were also found to have the highest level of participation [17]. Although variations in participation were described in the literature across regions, type of community (urban/rural) and school size did not explain the intensity or frequency of leisure participation among

Table 2. Study characteristics.

Population/Author	Sample	Design	Environmental domains					Measures of Environment	Measures of Participation
			Products/ Technology/ Natural Environ.	Supports/ Relationships	Attitudes	Services, Systems, Policies	General Environment		
Cerebral palsy									
Chan et al. [41]	Age = 0–22 years, <i>n</i> = 181	Cross-sectional	✓		✓	✓		Survey developed for study	Survey developed for study
Colver et al. [16]	Age = 8–12 years, <i>n</i> = 818	Cross-sectional	✓	✓	✓	✓		ECEQ	
Fauconnier et al. [17]	Age = 8–12 years, <i>n</i> = 818	Cross-sectional	✓					Regional variation	LIFE-H (parent interviews)
Hammal et al. [33]	Age = 4–5 years, <i>n</i> = 443	Cross-sectional	✓					District of residence	LAQ
Heah et al. [46]	Age = 6–16 years, <i>n</i> = 8	Qualitative phenomenological		✓	✓	✓		Semi-structured interview	Semi-structured interview
Imms et al. [34]	Age = 11–12 years, <i>n</i> = 108	Cross-sectional	✓					Region, school size (demographic questionnaire)	CAPE/PAC
Imms et al. [12]	N/A	Comprehensive literature review	✓		✓			N/A	N/A
Kang et al. [53]	Age = 13–21 years, <i>n</i> = 209	Cross-sectional				✓		FES, MPOC, service questionnaire.	CAPE
Lawlor et al. [35]	Age = 4–17 years, <i>n</i> = 12	Qualitative thematic approach	✓	✓	✓	✓		Semi-structured interviews	Semi-structured interview
Majnemer et al. [49]	Age = school age years, <i>n</i> = 95	Cross-sectional		✓		✓		Parental Stress Index, IOF	CAPE
McManus et al. [43]	Age = 5–14 years, <i>n</i> = 28	Qualitative descriptive	✓	✓	✓	✓		Discussion groups	Discussion groups
Michelsen et al. [31]	Age = 8–12 years, <i>n</i> = 813 with CP, 2939 without	Multi-centre cross-sectional	✓	✓				Countries	LIFE-H (parent interviews)
Mihaylov et al. [40]	N/A	Comprehensive literature review	✓		✓	✓		N/A	N/A
Palisano et al. [42]	Age = 17–20 years, <i>n</i> = 10	Qualitative descriptive	✓	✓	✓			Semi-structured interview	COPM, semi-structured interview
Radell et al. [52]	Age = school age years, <i>n</i> = 15	Qualitative descriptive			✓	✓		Semi-structured interview	Semi-structured interview
Shikako-Thomas et al. [13]	N/A	Systematic review	✓		✓	✓		N/A	N/A
Welsh et al. [32]	Age = 5 years, <i>n</i> = 28	Cross-sectional	✓	✓	✓	✓		Profile of regions, questionnaire about barriers	LAQ

(continued)

Population/Author	Sample	Design	Environmental domains					Measures of Environment	Measures of Participation
			Products/ Technology/ Natural Environ.	Supports/ Relationships	Attitudes	Services, Systems, Policies	General Environment		
Physical disabilities Barf et al. [39]	Age = 16–25 years, <i>n</i> = 179	Cross-sectional	✓			✓		Structured questionnaire	Interview
Harding et al. [37]	Age = 8–13 years, <i>n</i> = 6	Mixed method case study	✓	✓				Photographs of activities, semi- structured interview	CAPE
King et al. [18]	Age = 6–14 years, <i>n</i> = 427	Cross-sectional model testing (SEM)					✓	CHIEF, FES, IOF, SSSC	CAPE/PAC
Law et al. [19]	Age = 6–14 years, <i>n</i> = 427	Cross-sectional	✓		✓	✓		CHIEF	
King et al. [38]	Age = 6–14 years, <i>n</i> = 427	Cross-sectional - construct validity	✓	✓	✓			CHIEF/FES/IOF/SSSC	CAPE/PAC
Law et al. [47]	Age = 3–12 years, <i>n</i> = 22	Qualitative descriptive		✓	✓	✓		Semi-structured interview	Semi-structured interview
Autism									
Howell et al. [48]	Age = 8–14 years, <i>n</i> = 4 families	Qualitative descriptive	✓	✓		✓		Semi-structured interview	Semi-structured interview
Orsmond et al. [44]	Age = 10–47 years, <i>n</i> = 235	Cross-sectional	✓	✓	✓	✓		Survey questions	Survey questions
Yuill et al. [36]	Age = 5–11 years, <i>n</i> = 8	Semi-experimental pre-post	✓	✓				Playground design	Observation of play (video)
ABI									
Bedell and Dumas [51]	Age = 3–21 years, <i>n</i> = 60	Cross-sectional		✓	✓	✓	✓	CASE	CASP
Bedell [22]	Age = 3–22 years, <i>n</i> = 313	Cross-sectional					✓	CASE	CASP
Galvin et al. [26]	Age = 5–15 years, <i>n</i> = 20	Cross-sectional					✓	CASE	CASP
Down syndrome									
Guralnick [45]	Age = 4–6 years, <i>n</i> = 42	Cross-sectional		✓				Maternal beliefs about inclusion, maternal involvement (questionnaires)	Peer involvement interview
Sayers Menear [50]	Age = 5–14 years, <i>n</i> = 13	Qualitative descriptive		✓		✓		Semi-structured interview	Semi-structured interview

CAPE = Children's Assessment of Participation and Enjoyment, PAC = Preferences for Activities of Children [18]; COPM = Canadian Occupational Performance Measure [21]; CASP = Children and Adolescents Scale of Participation [22,51]; LAQ = Lifestyle Assessment Questionnaire [32]; and LIFE-H = Assessment of Life Habits [31]; CHIEF = Craig Hospital Inventory of Environmental Factors; CASE = Children and Adolescents Scale of Environment [26]; ECEQ = European Child Environment Questionnaire [16]; FES = Family Environment Scale [18,38,53]; IOF = Impact on Family Scale [18]; PSI = Parental Stress Index [29]; SSSC = Social Support Scale for Children [30]; MPOC = Measure of Process of Care [54].



Table 3. Measures of participation and environment.

<i>Participation measures</i>		
CAPE [20]	Children's Assessment of Participation and Enjoyment	Participation in out-of-school activities: recreational, physical, social, skill-based and self-improvement activities
COPM [21]	Canadian Occupational Performance Measure	Performance in areas of self-care, play and productivity
CASP [22]	Child and Adolescent Scale of Participation	Participation in the home, community and school settings
LAQ-CP [23]	Lifestyle Assessment Questionnaire	The impact of disability on the lives of children with cerebral palsy and their families, in terms of: physical independence, mobility, schooling, clinical burden, economic burden and social integration
LIHE-H [24]	Assessment of Life Habits for Children	Participation accomplishment of daily activities and social roles
<i>Environmental measures</i>		
CHIEF [25]	Craig Hospital Inventory of Environment Factors	Physical, social and attitudinal barriers within the environment
ECEQ [16]	European Child Environmental Questionnaire	Physical, social and attitudinal environmental features
FES [27]	Family Environment Scale	Family cohesion and family perception towards recreation
IOF [28]	Impact on family scale	The impact of living with a child with a disability on various components of family life
PSI [29]	Parental Stress Index	Extent of stress in parent–child system
SSSC [30]	Social Support Scale for Children	Supportive relationships for the child

children with CP in the presence of a child's functioning and temperament [34].

Transportation, including use of appropriate vehicles, available parking, utilization of mobility equipment and structural adaptations, was identified as a facilitator to participation of children with CP [35]. Playground design, including the physical layout in terms of spatial density, a clear circuit and a high lookout tower, increased play of children with autism [36]. Finally, connecting with the natural environment, such as animals and plants, was positively related to recreational activities among children with physical disabilities [37].

### Barriers

In a review study [12] focusing on children with CP, one of the most common barriers to participation was the physical accessibility of the environment. Another review [13] indicated that the physical environment, i.e. structure and lack of equipment, was a barrier for leisure participation. Physical barriers in the environment, including the natural and built environment as measured by the CHIEF, were negatively associated with participation in after-school activities [18,38] and were one of the most frequent barriers to participation of children with physical disabilities [19].

Additional studies provide more detailed information about the physical aspect of the environment in the context of those living with motor impairments such as CP and spina bifida. Accessibility of buildings [39], building structure [40], access to public transportation and lack of ramps, elevators and parking space for wheelchairs [41] all limited participation in work, community and outdoor activities. Dissatisfaction with public transportation was expressed as a restriction to participation [42]. Lack of suitable supports and presence of stairs were significant barriers to participation [32]. Need for special equipment, lack of adequate space and lack of access were also identified as barriers to the participation of children living with CP [35,43].

Children and youth with physical disabilities reported the need to navigate the environment in order to overcome barriers. When intending to participate in community activities, negotiation of the environment takes place [37] and involves adapting to situations by accounting for environmental barriers. Such barriers include crowds, terrain and distance, as well as size and layout of the built environment [42]. Overall, barriers related to Products and Technology/Natural environment were observed in 54% of the studies that examined this domain.

### Evidence related to the effect of Support and Relationships on participation

#### Supports

Seven papers provide evidence for the positive influence of *family support* on participation. Parental involvement, such as arranging play [44–46] and vigilance as well as parental support [35,38,43,47] all had a positive influence on social participation and fostered friendship development. The most common types of parent support include physical support, supervision and advocacy by parents. Five papers showed that the support of peers, friends and classmates [37,38,48] promoted participation. Similarly, Colver et al. [16] showed the importance of emotional and physical support from classmates, family and teachers, among other environmental items on the ECEQ. These supports were all evident in districts of Europe in which participation levels were relatively high [31]. Overall, supports were examined in 61% of the studies within this domain.

#### Barriers

Parents expressed that their over-protectiveness limited their child's independence [46] and that parents' stress was associated with decreased participation [49]. Lack of support from staff and service providers, for example, lack of personal assistance, specialists and information from the staff, were found to limit participation [32,47,50,51]. Finally, depending on others for mobility was also found to restrict participation [42]. Overall, barriers related to Support and Relationships were examined in 39% of the cases.

### Evidence related to the effects of Attitudes on participation

#### Supports

Qualitative research has shown that positive attitudes and values within communities and cultures can facilitate participation. Positive attitudes of people in community programs and schools have been identified as facilitators to participation for children with disabilities [43]. In some cultures, as reported by immigrant families originated from Somalia, for instance, persons with mental or physical impairments are expected to have a job, marry and do things that other adults do [52]. These values can promote participation in children as well. Research has also shown that positive attitudes within families can facilitate participation.

Children with disabilities receive support from immediate and extended family members to help them participate, suggesting an underlying positive attitude toward the child and the disability [47]. Families who hold attitudes that lead them to promote the child's independence and advocate for the child can be facilitators of participation [35]. Parents' values and preferences also affect the type of activity that they choose for their child with CP [46]. In fact, family recreational and cultural orientations are significantly associated with the intensity of leisure participation [18,38]. Overall, supports related to the domain of Attitudes were examined in 33% of the studies.

### Barriers

Negative attitudes within communities can be a significant barrier to participation among children with disabilities. Review articles have identified that, particularly for children with CP, a common barrier to participation is social attitudes [12,13] involving stigma and bullying [40]. Similarly, parents' reports reveal that negative attitudes restricted participation of children and youth with ABI [51], CP [32,41] and variety of physical disabilities [18,19]. Qualitative research with parents of children and youth with CP provide evidence that attitudes limit participation of their children. Attitudes of community members are frequently seen as negative, and are considered barriers to participation [43].

Some studies identified specific parts of the community where attitudinal barriers are present. Perceived attitudes of community members can lead to changes in the choice of activity for some families, such as choosing certain restaurants to avoid stares [35]. Youth with CP adapt to attitudinal barriers as they navigate through their environments and experience mobility [42]. Parents of children with autism reported that members of their churches did not understand autism and sometimes did not support their children in attending church [48]. Another study [47] identified negative societal attitudes toward disability and beliefs about competition in sports among staff, service providers and parents of typically developing children. Parents of children and youth with physical disabilities in this study identified attitudes as the primary environmental barrier to their children's participation.

Cultural values and habits can also enact as barriers to participation. For example, lack of facilities to practice cultural hygiene, eating and praying customs/habits restricted children's participation in summer camps among other activities [52]. Overall, barriers related to the environmental domain of Attitudes were examined in 67% of the studies.

### Evidence regarding the effect of Services, Systems and Policies on participation

#### Supports

Services and policies that support participation are evident. Greater participation of youth with CP is associated with inclusive educational programs and the extent to which the desired community recreational activities were obtained [53]. Reception of rehabilitation services [49] and an increase in appropriate community-based programs [50] and recreational facilities [32] are associated with greater participation. Similarly, receiving a greater number of services and being educated in a fully- or partially-inclusive school environment were all associated with greater rates of participation in social and recreational activities among adolescents and young adults with autism [44]. Parental education from professionals regarding home or community-based recreation activities was considered as support for participation of children with developmental delay [50] and autism [48].

Parents of children with autism advocating for inclusive church environments identified system-level supports for participation in religious activities [48]. Examples include modifying the curriculum of Sunday school, hiring trained aids and staff and providing respite for parents. In total, supports were reported in 37% of the studies that examined this environment domain.

#### Barriers

Several papers addressed barriers related to services, systems and policies, and their impact on participation. Limited *services* including availability of accessible transportation services [41,43], lack of community programs [19,46] and access to information [43,51,52] are all reported as barriers to participation of children and youth with CP. *System-level* barriers to participation were evident including bureaucracy [43], waiting time for services or lack of suitable programming [26] and segregation of children with disabilities from their non-disabled peers [13]. In contrast, school inclusion or integration may lead to isolation among parents who are immigrants [52] and in another case, school type (special/mainstream) did not have an effect on participation [34]. Financial hardships, such as increased cost of appropriate programming [39,40] accompanied by limited access to funding [26,35,43], can be an important barrier to participation. Finally, rigid or non-inclusive *policies* within institutions restricted the participation of children and youth with physical disabilities [18,19,47]. Overall, within this environmental domain, barriers were reported in 63% of the studies.

### Evidence regarding the effect of the overall environment on participation

Several studies examined the environment as a whole, rather than focusing on specific environmental factors. The extent of problems in physical, social and attitudinal aspects of the environment, as measured by the CASE, is moderately correlated with participation among children with ABI [22,26,51]. These environmental factors have been reported to explain 9% of the variance in participation [51] in the presence of a child's daily functioning and abilities. Barriers related to policies, physical/structural, work/school, attitudes/support and services/assistance are negatively associated with leisure participation among children with physical disabilities [18].

In a study of several European countries, Michelsen et al. [31] identified that children in Denmark with CP participate to the same extent or more than children in the general population, compared to other countries where participation was lower for children with CP. This finding may reflect more positive attitudes toward disability and inclusion that is reflected in policy, legislation, advocacy, services and support. An extension of this project [16] examined the environmental characteristics of the same regions and found that environmental access in Denmark was indeed above the average in all environmental domains (physical, social and attitudinal).

Time is another barrier that was reported in relation to navigating the environment. The degree of planning required to participate in activities, along with the lack of available time, were both identified as barriers to children's participation [35]. The issue of time (i.e. extra time required for activities) and of constantly *planning ahead* were also expressed as a way to deal with environmental barriers in the context of mobility and engagement in the community [42]; this experience brought about frustration. Similarly, lack of time or *time pressure* was evident in Mihaylov et al.'s [40] review as one of the environmental barriers to participation.



## Discussion

### Barriers and supports across environmental domains

This scoping review reports that all environmental domains in the ICF influenced children's participation. The most common facilitators included social support from family and friends, followed by geographic location. In contrast, the most common barriers were negative attitudes, followed by the physical accessibility of the environment, services and policies and lack of support from staff and service providers. Overall, more barriers to participation are evident but there are a substantial number of environmental supports. Attending to and strengthening the positive aspects of the environment, rather than only focusing on the barriers, can facilitate the development of treatment approaches.

The results were surprising, considering that the majority of the studies focused on children with physical disabilities (74%). In this population, one might assume that there would be more barriers within the physical environment (the Products and Technology/Natural Environment domain). Instead, the Attitudes domain represented the leading barrier. This coincides with Law and colleagues' [47] findings in which parents stated that attitudinal barriers are key as they often prevent change in other barriers, such as those found in the physical environment.

The results also illustrate that barriers and supports are not necessarily opposite constructs. For example, depending on others for transportation/mobility served as a barrier [42] to youth participation; on the other hand, receiving assistance from others was perceived as a facilitator [35]. The way in which transportation assistance is provided may influence its perception as a barrier or support. Similarly, inclusive environments and integration can serve as supports in some cultures [44,49,53], and as barriers in others [52], or may not have an effect at all [34]. Another example is related to parents' involvement and support that can at times facilitate participation [35,44] and in other cases enact as a barrier [46]. This observation, that supports and barriers are potentially two independent constructs, can inform the development of appropriate scales to measure the environment. For example, one can consider developing two separate scales: one that measures the level of support within the environment and the other measures the level of interference rather than one scale with two opposite poles: support and barriers. As well, these findings highlight the need to individually assess and plan interventions to facilitate participation.

Finally, several unique barriers and supports revealed in this review include the issues of time, planning ahead and negotiating the environment. These findings indicate that children with disabilities experience a different pace/rhythm of their daily activities. Practitioners can direct intervention plans towards family routines, habits and time-management/organization strategies to address these barriers. Another unique finding of this scoping review is access to *information* or lack of knowledge and the need for *education* of parents by service providers. This coincides with other studies' investigation of the process of professional care that showed the importance of information, provided by practitioners, to the well-being of parents [54]. Making information accessible to all users and providing ongoing education are additional avenues of intervention and knowledge translation in which attention can be directed.

### The effect of district/region on participation of children with CP

This review reveals research indicating that participation varies across regions; this finding appears to reflect regions in which positive attitudes were demonstrated in policies, legislation

and services. Colver and colleagues [16] further explored these data and found that the level of environmental access varies within these same regions. Our exploration of the evidence reveals that participation levels were high in the regions that were more accessible. The next step can be to statistically test the effect of specific environmental facets within these regions on participation and to identify the most influential environmental factors that account for participation levels and their variations.

### Research gaps and future directions

This scoping review reveals several gaps in the literature. In terms of studied population, the focus of most of the studies was on children with physical disabilities and in particular, CP. Expanding the population under study beyond physical disabilities is needed, including for instance, communication and vision disorders. The majority of quantitative studies were cross-sectional in nature, and there is additional need for longitudinal and intervention studies. The study population age range fell mostly between 6 and 14 years old, and thus more research studies are needed for older children such as adolescents and young adults who face major life transitions. For these populations, there is less knowledge about specific environmental factors that impact participation outside of the school and work context.

Other gaps from this work were highlighted by the way in which participation and environment were measured in the research. While some measures examined broader facets of participation or the environment (e.g. LIFE-H and CHIEF, respectively), other measures examined more specific characteristics (e.g. CAPE and FES, respectively). It is important to measure participation in different settings while capturing the impact of the environment on participation. For example, the Participation and Environment Measure for Children and Youth (PEM-CY) [55] is a new assessment that links environment data to participation location.

Finally, our findings suggest that negative attitudes and social supports are the leading environmental factors determining participation. Further examination of these factors is needed; notably developing and testing intervention plans to minimize or nurture environmental conditions to foster children's participation.

### Implications for stakeholders

The findings of this review suggest several implications for practice and policy. Children with disabilities, parents and clinicians, for instance, can work together on time use and planning-ahead strategies to facilitate participation. Clinicians can engage and educate parents about useful strategies for removing environmental barriers and advocating for increased physical accessibility within community settings, in order to promote social inclusion of their children. These actions may also help to improve attitudes and reduce stigma related to disability with community members.

Policy makers can enact legislation to enable more participation-based communities to exist; for example, by promoting "universal design" public spaces and by making information about the resources, services and rights of children with disabilities more accessible. They can also address negative attitudes by providing education and mandating the value of inclusion of children with disabilities in community settings and programs.

### Strengths and limitations

A major strength of this study is the systematic and broad search that likely captured all relevant articles published in

academic journals. The search did not address grey material, a factor that may have resulted in missing relevant information. A further limitation could be the fact that no assessment of the quality of the studies in the review was completed. However, quality evaluation of studies is not typically conducted in scoping reviews [14] due to the large variety of study designs, research approaches and, in our case, the newly-emerging area under study. This project, therefore, focused on the information provided within the studies rather than obtaining information after a quality-based selection. Finally, the review focused only on out of school participation, a decision that likely resulted in omission of studies that could shed light on the relationship between the environment and participation. This decision was justified, however, given the different levels of structure and policies in school-based and out of school-based participation. The impact of environmental factors on out-of-school activities, notably leisure, is unique and make a crucial contribution to child development and well-being [56]. Nevertheless, participation and the environment is an emerging area of research, and hence further attention can be directed to other areas of participation such as school activities in order to generate a more comprehensive synthesis.

## Conclusions/summary

There is an increasing amount of research evidence regarding the role of the environment in explaining participation in children and youth with physical disabilities. Future studies can focus on youth and young adults with various types of disabilities and utilize longitudinal and semi-experimental designs. Both practitioners and decision-makers can focus their attention on specific aspects of the environment, for example, attitudinal challenges and social support, in order to foster inclusion and participation-based communities. Moreover, our findings suggest that barriers and supports vary across disability type and clinicians are encouraged to assess environmental factors at the individual level.

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## Declaration of interest

The authors report no conflict of interest.

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## Appendix

### List of 44 disorders used in search

Cerebral Palsy, Spina Bifida OR myelomeningocele OR meningocele, Down syndrome, Attention Deficit Disorder OR ADD OR Attention Deficit/hyperactivity disorder OR ADHD, Developmental Coordination Disorder, Communication Disorder OR DCD OR developmental dyspraxia OR Motor coordination disorder OR clumsy child syndrome, Eating disorder OR disordered eating, Orthopaedic Muscular Dystrophies (OR...Duchenne's, Spinal Muscular Atrophy), Congenital deformity, Brachial Plexus injury, Epilepsy OR seizure disorder, Movement disorder, Autism OR autistic disorder OR Autism spectrum disorder OR ASD OR Pervasive Developmental Disorder OR PDD OR PDD-NOS, Sensory disintegrative disorder OR sensory defensiveness OR sensory processing disorder, Anxiety, Global developmental delay, Fine motor dysfunction, Acquired brain injury OR traumatic brain injury OR brain injury OR head injury Learning Disability, Non-verbal learning disabilities/disorder, Cleft lip and palate (OR...cleft lip; cleft palate; cleft lip and palate; orofacial cleft), Juvenile arthritis.