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The experiences of participating in winter among youths with a physical disability compared with their typically developing peers

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Abstract

Background Having a physical disability and using a wheelchair can create difficulties in navigating the physical and built environment, especially during winter when snow and ice become problematic. Little is known about the experiences of winter among youth who use an assistive mobility device. This study aimed to understand how youth with a physical disability experience winter, compared with typically developing peers.

Methods A purposive sample of 25 youths (13 with a physical disability; 12 typically developing) completed a 2-week weather journal and photographs in two Canadian cities during winter. These data were used to guide semi-structured interviews with participants.

Results Youths with disabilities experienced many similar challenges in winter, such as health and safety concerns and accessibility issues, compared with typically developing youth – but to a greater extent. Youths with disabilities reported more challenges going outdoors during winter and negative psychosocial impacts, including loneliness and increased dependence, compared with peers without a disability. They also, however, described developing several adaptive strategies to cope with these challenges.

Conclusions There is a strong need to remove physical and environmental barriers to facilitate the participation and inclusion of youth with disabilities in winter.

Keywords
climate, disability, participation, weather, winter

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Introduction

People with disabilities are a vulnerable group within society. They are expected to be disproportionately impacted by climate change, which recent evidence positions as one of the major challenges to quality of life in this century [Bell *et al.* 2007; Intergovernmental Panel on Climate Change (IPCC) 2007]. Winter weather poses serious challenges to navigating the built environment, especially for people with disabilities (Wee 2007; Lindsay & Yantzi 2014). Most research on this topic has focused on elderly populations and the risk of falling or the adaptation of devices. Research on adults with disabilities has also found that weather-related challenges affect activities of daily living, leaving many people with mobility impairments feeling

isolated, lonely and depressed (Lemaire *et al.* 2010; Beynon *et al.* 2011; Morales *et al.* 2014).

In contrast, little is known about winter experiences among youth with physical disabilities compared with typically developing peers. Over 200 000 Canadian children and youth live with a physical disability (Statistics Canada 2008) and many depend on assistive mobility devices. To help enhance their participation, inclusion and well-being in winter, it is critically important to develop a better understanding of how youth with disabilities experience winter (Forsyth & Jarvis 2002). Such youth participate in recreational and social activities less than their peers, and they are at increased risk of social isolation (Law *et al.* 2006). Youth who are socially excluded often experience adverse physical, mental and social consequences, such as depression, anxiety and low self-esteem (Vreeman & Carroll 2007; Lindsay & McPherson 2012). Thus, improving access to inclusive environments is essential.

Methods

Our research aimed to (1) explore how youth with a physical disability experience winter compared with typically developing peers and (2) document how youth use their assistive mobility device on a typical winter day. A qualitative research design with multi-methods following thematic analysis principles was used (Stakes 2000). We employed semi-structured one-on-one in-depth interviews, journals and photo elicitation. This multi-method approach has been used successfully in childhood disability research (Gibson *et al.* 2013).

Sample

We drew a purposive sample from two urban paediatric rehabilitation centres in Ontario and Quebec, Canada. Both sites experience heavy accumulation of snow and below-freezing temperatures in winter (December–March). The average number of days with snow is 42 with temperatures ranging from −2 to −32° C in the winter (Environment Canada 2000). All participants with a disability met the following inclusion criteria: (1) youth with a mobility-related physical disability (e.g. cerebral palsy, spina bifida, spinal cord injury) requiring the daily use of a wheelchair; (2) aged 12–21; and (3) at least 1 year's experience using an assistive mobility device. Exclusion criteria included youth who were ambulatory (i.e. use canes, walkers) because their experience of winter were expected to be quite different from non-ambulatory youth. We also used local advertisements to recruit a comparison sample of 12 typically developing youth, aged 12–20, matched as closely as possible by gender and location. Four youth also had their parents participant in the interview.

Staff and youth facilitators at the paediatric rehabilitation centres informed youths with disabilities about the study. Interested youths were screened to ensure they met the eligibility criteria. If they accepted the invitation to participate, they were given an information package. A researcher explained the study to them and asked if they had any questions before taking part. Each participant signed a consent form. We obtained ethical approval from local research ethics boards.

Design

We used a descriptive qualitative design that involved structured journals, photo elicitation and in-depth interviews (Grbich 2007).

Structured journal

Participants kept a written, structured journal (see Table 1) to record narrative reflections of their weather-related experiences (Jacelon & Imperio 2005). We developed the structured journals based on pilot study findings (Lindsay & Yantzi 2014), and we further piloted them for feasibility and comprehensiveness with two additional youth who use wheelchairs. Each participant kept a journal for 2 weeks during the winter season. We chose this timeframe to allow for sufficient winter weather events, and it is consistent with other studies using journal methods (Alaszewski 2006).

Photo elicitation

Participants also took photographs to capture their experiences, recording the date, time and a brief caption for each photo. We later used their photos during semi-structured interviews to elicit participant experiences. It is a well-established method among researchers to ask people who are not typically represented (i.e. youth with disabilities) to photograph their realities and use the pictures to develop rapport and encourage reflection (Capello 2005; Jurkowski 2008; Gibson *et al.* 2013).

Interviews

After participants documented their experiences through journals and photos, we conducted semi-structured interviews (see Table 2).

Table 1. Sample of structured journal

Days 1–7	Date _____
1 a. Did the weather affect your activities today? b. What type of weather affected you? (snow, ice, rain, cold, slippery conditions)	–
2 a. Did you go outside today? b. Where did you go? c. When? (day/evening/night)	–
3 a. How did you get there? (public transit: subway, bus, school bus, wheel-trans, car) b. Did the weather affect the way you travelled today?	–
4 About how long did you spend outside of your home? (Total amount of time you were in the community)	–
5 About how long did you spend outside? (waiting for the bus, getting to your destination, etc.)	–
6 Did you experience any difficulties during your activities today? (snow, ice, cold)	–
7 Where did you come across difficulties? (roads, sidewalks, parking lots, your neighbourhood)	–
8 What strategies did you use to manage the weather?	–
9 Did the weather make you feel unhealthy today? (numbness, pain, breathing problems)	–
10 Did the weather make you feel unsafe today? (slippery conditions, wheelchair getting stuck in snow, etc.)	–
11 a. What winter clothing did you wear today, for the weather? (hat, gloves, scarf, extra layers) b. Did the clothing make your moving harder?	–
12 Was your wheelchair affected by the weather? (tire maintenance, battery level, cleanliness, other)	–
13 Was there anything you enjoyed about the weather today? (playing in the snow, winter sports, etc.)	–
14 What could be done to make things better/easier? (changes to the wheelchair, changes in the environment)	–
15 Did you take any photos today? (indicate photo ID)	–

Data collection

Data collection occurred during the winter months (December 2013 to March 2014). A researcher gave participants instructions on how to document their winter experiences using a structured journal and camera, asking them to make a journal entry and take at least one picture per day. After 2 weeks, we collected their journals and photos. Within 1 week of collecting the materials, a researcher trained in qualitative methods conducted the interviews, lasting 18–42 min.

Table 2. Interview guide

1 Can you tell me about some of the photos that you took? (use photos as prompts)
2 What are your favourite things about winter? (use photos as prompts)
3 What kinds of activities do you take part in during winter? a. Probe for how these activities may be different compared with summer activities. b. Do daily living activities outdoors take longer in winter? (e.g. getting to and from)
4 Do you have any challenges in moving around (probe: with your mobility device) in the winter? If so, what challenges do you encounter? (use photos as prompts) a. Probe for different contexts and types of weather (e.g. snow, slush, ice) b. Does winter clothing affect use of mobility device?
5 Have you experienced dangerous situations when you were outside (e.g. slipping, falling)?
6 How do you normally get around in the wintertime? a. Probe for modes of transportation (e.g. public transport, driving)
7 Do you go out as often as you normally do in the summer? a. If no, why not? (e.g. too cold, transportation difficulties, not as many activities) b. How much time do you spend outside in the winter c. What are things that you've got to take into consideration before going out in winter?
8 What advice would you give to other youth during the winter? (probe: mobility device)
9 What can people do to help youth with disabilities deal with the winter? (use photos as prompts)
10 Is there anything else that you would like to add that we did not get a chance to talk about?

Data analysis

Data collected through journal entries were typed up and interviews were digitally audio recorded, professionally transcribed verbatim and entered into QSR International (2012). Three investigators independently read through all journals and interviews while noting emerging themes. Through an initial open-coding procedure, we identified patterns and themes in participants' winter experiences for both groups. Then, we drew on the World Health Organization's (WHO) (2001) International Classification of Functioning (ICF) to help categorize our findings because the ICF helps to capture the complexity of youth's winter experiences [i.e. body structure and function, environment (both physical and social), activity and participation]. The two groups of youth were analysed separately and then compared and contrasted. A constant comparative approach was used until consensus was reached among the research team on the final coding scheme. Saturation was reached when no new data emerged regarding a theme and each theme was well developed (Grbich 2007). We applied a peer debriefing validation process (formal discussions among the research team) to help ensure themes represented the range of ideas expressed (Grbich

Table 3. Overview of participants

ID	Age	Gender	Disability	Type of device
1	13	Male	Cerebral palsy	Power chair
2	14	Male	Cerebral palsy	Power chair
3	21	Male	Cerebral palsy	Power chair
4	20	Male	Cerebral palsy	Power chair
5	20	Female	Cerebral palsy	Power chair
6	20	Female	Cerebral palsy	Power chair
7	14	Male	Muscular dystrophy	Power chair
8	14	Male	Muscular dystrophy	Power chair
9	19	Male	Physical disability†	Power chair
10	16	Male	Physical disability†	Power chair
11	20	Female	Physical disability†	Power chair
12	20	Female	Physical disability†	Power chair
13	14	Male	Physical disability†	Power chair
14	14	Female	None	None
15	12	Female	None	None
16	12	Female	None	None
17	20	Female	None	None
18	21	Female	None	None
19	17	Female	None	None
20	16	Male	None	None
21	17	Female	None	None
22	16	Male	None	None
23	16	Female	None	None
24	17	Male	None	None
25	19	Female	None	None

†Diagnosis not specified.

2007). We documented an audit trail of key decisions regarding coding. We also abstracted direct quotes representative of each theme, while considering the whole journal or interview context.

Results

Our final sample comprised 25 youths (13 with a physical disability; 12 without), including 12 boys and 13 girls, aged 12–21. All those with a physical disability used a powered wheelchair (see Table 3).

We found several similarities and differences in the experiences of winter among youths with a physical disability compared with their typically developing peers. Although all participants encountered some weather-related barriers and vulnerabilities (i.e. health, safety and accessibility issues), they were tougher for youths with disabilities. Youths with disabilities reported more challenges going outdoors in winter and described negative psychosocial impacts. They also described several strategies for adapting to winter. Representative quotes for each theme, compared by youth with or without a disability are provided in Table 4. Although the themes are presented separately, they inherently overlap.

Body structure and function

Poor weather conditions affected the function of many youths with disabilities, who reported pain in their legs and hands, numbness, tightened muscles, difficulty breathing or other concerns. For example, one said, 'because I'm sitting in the chair and I'm not moving, I do get colder, quicker' (#4 disability). Youth without disabilities did not mention how winter influenced their body function.

Environmental factors

Weather

All participants reported being affected by winter weather (i.e. snow, ice, cold temperatures, wind) and encountered some physical barriers during winter months; however, youths with disabilities reported them to a greater extent. For example, one said, 'The snow affected me today. I stayed home and did not go outside' (#1 disability). Such weather conditions often prevented youths with disabilities from taking part in their normal everyday activities.

To cope with mobility challenges, most youths with disabilities reported using wheelchair transportation taxi services more often in winter than summer. For example, one said, 'I had to use wheeltrans today because it was cold and snowy' (#6 disability). However, this service was routinely cancelled during snowstorms. When youths with disabilities travelled in their parents' vehicles instead, they often found accessible parking spaces filled with snow.

In contrast, most typically developing youths embraced winter with enthusiasm, seeing it as an opportunity to take part in different activities and sports. For example, one explained, 'I love the snow . . . There are a lot of activities that can happen when the snow falls . . . like building snowmen or just playing outside in general. I like to ski' (#13 no disability). They did, however, report needing more time to get ready to go outside (i.e. dressing in warm clothing) and feeling cautious during severe weather, such as snowstorms or icy conditions.

Physical environment and accessibility

Poor winter weather often led to inaccessible spaces that youth typically encountered in their everyday routines. For example, one youth noted how little snow is needed to create challenges: 'There are just 3 cm of snow which I have trouble getting over'

Table 4. Representative quotes for each theme of the ICF

Theme	Youths with disabilities (YWD)	Typically developing youths (TDY)
BODY STRUCTURE AND FUNCTION		
Body function	'My legs really hurt and my hands were numb from the cold'. (#1)	No examples given.
Environment		
Weather	'In the winter the sidewalks are barely plowed if at all. This is a huge concern for me and in a lot of ways I don't have as much freedom in the winter months . . . In the summer I go out a lot because there aren't as many obstacles impeding my movement'. (#3) 'When we go out it's only for 2 min and we're frozen . . . The winter is not easy. You cannot go out in temperatures like that'. (#8)	'I love the snow'. (#13) 'I love the cold. Even when it's really cold I still like to go out walking. I love being outside when it's cold . . . I like the snow. It's calming and peaceful outside'. (#17) 'The snow made it difficult to see [the ice]'. (#18)
PHYSICAL ENVIRONMENT (*accessibility*) (*Safety*)	'Sidewalks are the biggest issue because I can't even get out of my street. So that's really bad and, number two is curb cuts. Even if the sidewalk is plowed, those are neglected. Always. Those are biggest challenges'. (#4) 'In the winter there's a lot of snow and you cannot leave the house. The problem is that when they remove the snow they block off the entrance so you can't get out to access public transportation'. (#9) 'I've slipped a few times because when I'm stuck in the snow the wheelchair has a mind of its own'. (#1) 'Ordinarily I would take public transit but with the winter weather it is not safe to do that as the roads are never plowed well enough to make my personal safety a non-issue'. (#3) 'The roads are slick with salt and ice. It's quite worrisome to consider negotiating the snowy roads and sidewalks on my own . . . In my naivety I attempted to venture out on my own and this was such a mistake. I quickly became stuck a short distance from my house and had to rely on a passersby to free me'. (#3) 'I need my fingers so I can use my phone. It's important if I'm out on my own. It's a bad situation because I need to wear gloves but they are very hard to put on my hands. . . . and I can't take them off by myself. I can't use my phone if I needed anything'. (#4)	'When a lot of snow has fallen I find that it makes snow banks and you have to climb over just to get to the sidewalk. And black ice. I find that some places they don't put salt down to melt the ice so you have to be cautious of not slipping at all'. (#15) 'Sometimes they pile up the snow on the street corners, especially on the side streets. It's a bit unsafe climbing them when you have to cross the street'. (#15) 'I've fallen a couple of times in the snow but I think that happens to everyone'. (#16) 'When my dad picked me up from school the roads were slippery and we glided across. The roads were dangerous'. (#19) 'Depending on the weather it takes extra time to get there and extra clothing. We have to layer up if it gets cold so we don't freeze'. (#14)
SOCIAL ENVIRONMENT (*attitudes*)	'The sidewalks need to be plowed because that is really our road space. People need to be mindful that not everybody in a wheelchair needs to sit at home all of the time, nor should they be expected to do so . . . I opted not to go out today because I feel frustrated with everything; the bitterly cold weather and the people and their sometimes harsh attitudes towards me'. (#3)	Not applicable.
ACTIVITY		
Activity (*dependence*)	'She's so cold she needs her hat and gloves, and then she can't drive because she uses her head switches to drive. She doesn't use a joystick so winter poses a problem for her driving. . . . and that limits what you can do outside'. (#5) 'I cannot go out alone'. (#9) 'Summer is more enjoyable. You can go out alone'. (#4)	'The weather was my activity today. I made a snow fort'. (#2)
PARTICIPATION		
Participation	'I couldn't get to the bus stop because the sidewalks were not shoveled. My wheelchair got stuck multiple times'. (#6) 'My activities in the winter get lessened. I usually like to go outside a lot more – Just kind of hanging out, see where the wind takes me. I can't really do that and don't have that amount of freedom just because with winter comes a lot of planning. I have to plan not to be out too long because it gets really cold. Some places might not be plowed or shoveled. I don't really do much in the winter to be honest. Winter is kind of a very dormant state for me'. (#4) 'It's pretty limited in the winter. To be honest it's just kind of the mall and church and school. Sometimes out for dinner'. (#5) 'I personally don't like to use *Transhelp* a lot and I don't tend to rely on it. If I can make my own way either by public transit, or by wheelchair I would much rather prefer that. I just like the freedom. I like to know that if I want to stay out an hour longer or go home an hour earlier, I can do that and make that decision. So when it's winter I have to pretty much rely on Wheeltrans and Transhelp and those services. That's why it's limited. I only really like to use those services for when I'm going to school or it's very scheduled'. (#4)	'For me I don't really care. I spend time with my friends. I don't really think of the cold. It doesn't really bother me'. (#16) 'I like to go skating on an outdoor skating rink'. (#16) 'I like building snowmen and playing outside in general'. (#15)
Adaptations to winter to enhance participation	'Have people with you. I think the biggest way that I learned what I could and couldn't do, I'm very blessed and I have great friends. I was able to make mistakes and get stuck in the snow and still get out of it. Get a good family member and take it out for a spin. Obviously don't put yourself in danger. Try driving in a little bit of snow'. (#4) 'Drive slowly and watch out what's in front of you'. (#1) 'Be mindful of your personal safety and road conditions. Dress in visible materials so you can be seen by practically everyone'. (#3)	'Try to stay as active as you can in the summer . . . try to find friends that would go with you. That would probably motivate you to get out of the house'. (#18) 'Find something you like and stick to it so you don't sit at home on the computer all of the time'. (#15) 'Just bundle up. If you have a lot of clothes on you'll be ok'. (#19)

(#10 disability). Another said, 'When there is snow everywhere it is more difficult to move because there is limited space' (#10). Many found it difficult to move around outside, even at school, due to unsalted and unplowed playgrounds and sidewalks and/or blocked curbs at intersections. Although typically developing youths also encountered such barriers, they could often navigate around them.

Safety

All participants described safety concerns arising from physical barriers in winter, such as slippery sidewalks and roads. Youths with disabilities also worried about getting stuck in snow or ice, which left them dependent on others during winter months. Youths with disabilities were also concerned about having to drive their wheelchairs on the road when sidewalks were unplowed. For example, one said: 'with a wheelchair, it slips. If I have to go on the street I am worried about being hit by a car' (#11 disability).

Social environment and attitudes

Youths with disabilities often experienced stress and frustration that were created in social environments in winter, especially with regard to inaccessible environments caused by inadequate plowing and snow removal in public spaces, as well as poor attitudes directed towards people with disabilities. For example, 'It just seems that unless you're walking, you're treated like a second-class citizen' (#4 disability). Frustrations often arose when they tried to take public transportation and found bus drivers were unaccommodating of people with disabilities. In contrast, typically developing youths often found snow to be a source of enjoyment and they did not report negative attitudes in their social environment.

Activity

Most youths with disabilities said they lacked independence in winter because they had to rely on others to help them navigate snowy and icy conditions. For instance: 'I cannot go out alone in the winter' (#10 disability). For many, winter clothing posed a barrier to getting around outdoors.

Youth often had difficulty moving their wheelchairs while wearing a heavy winter coat and mitts. For instance: 'it's not easy to move the chair with a thick coat' (#8 disability). In fact, while driving their wheelchairs, most youths with disabilities were unable to wear mitts, which restricted their movements. In contrast, typically developing youth described extra clothing as an enabling factor to participating in outdoor winter activities.

Participation

All participants reported that winter weather influenced their activities and ability to get out of the house to some extent; however, more youths with disabilities reported physical barriers, inaccessible environments and fewer alternative modes of transportation. We found that youths with disabilities spent much less time away from home for indoor and outdoor activities, compared with typically developing peers. For example, one said, 'I am just going to school and staying home mostly' (#12 disability). Apart from time at school, youths with disabilities reported spending approximately 10–30 min per day outside of the home, most of which was spent travelling or waiting for rides. Based on journal entries, they also spent more time indoors. They also reported boredom and loneliness from spending so much of winter inside. For example: 'I don't know how to get around the issues of isolation during the winter. I just don't think there is anyway' (#5 disability).

In contrast, most typically developing youths enjoyed playing outside in the snow and engaging in winter sports and activities from 1 to 7 h per day. For instance, one said, 'I go out everyday for at least two hours or so. I like being out with friends and getting out of the house in general' (#17 no disability). Another reported, 'I like to play outside because it's fun and it gives me something to do . . . it's better than playing video games because you get physical exercise' (#14 no disability). They would simply bundle up when the weather was particularly cold or snowy or take extra time travelling when road conditions were poor.

All youths with disabilities reported being engaged in fewer activities in winter compared with summer. For example, one said, 'In the winter I can't go out in the field at school and play with my friends. I can do that in the summer, but in the winter I can't' (#1 disability). Some avoided going out in winter altogether to avoid the cold and/or problems with accessibility. To illustrate, one said, 'I don't have the chance to experience the outdoors in the winter with my wheelchair' (#2). Most youths with disabilities reported in their journals: 'I stayed home today and did not go outside' (#1 disability). This common occurrence often took place several days in a row.

In contrast, typically developing youths went out in winter as often as in summer, although their activities did differ between seasons. The most common journal entry among typically developing youths was 'the weather did not affect my activities today'.

Adaptations to winter to enhance participation

All participants indicated that going out in winter required more planning, time and awareness of their surroundings than summer outings. Youths with disabilities also described additional strategies for adapting to winter and overcoming barriers. Some made sure they travelled with a friend or asked others for help if they got stuck in snow. For example, 'I asked for help from a stranger when I got stuck. I also took a longer route to avoid as much snow as possible' (#6 disability). Others used door-to-door wheelchair transportation in winter to avoid getting stuck in the cold. A few avoided going out as much as possible.

Discussion

Our findings provide valuable insight into the experiences of winter among youth who use a power wheelchair, compared with their typically developing peers. This is a timely and significant topic given ongoing concerns about climate change and extreme weather, especially during winter (Bell *et al.* 2007). Youth with disabilities are considered a vulnerable group, anticipated to experience more negative effects of climate change [Intergovernmental Panel on Climate Change (IPCC) 2007]. Our findings highlight the importance of 'environment', within the ICF [World Health Organization (WHO) 2001]. The environment (especially weather) is often overlooked among those applying this framework (Rosenbaum 2007). Our results suggest that researchers and clinicians should not underestimate the importance of climate and seasonal variation within clinical practice, mobility and participation research (Lindsay & Yantzi 2014).

Our findings show that all participants experienced weather-related barriers and vulnerabilities; however, youths with disabilities reported more concerns. Past evidence suggests that snow and icy environments can create obstacles in the physical environment, particularly for those who use an assistive mobility device (Lemaire *et al.* 2010). Creating more accessible environments and properly clearing snow and icy surfaces is vital to enhancing the participation of people with disabilities in winter. Research shows that street crossings, sidewalks, curbs and bus stops are essential elements of community infrastructure that promote mobility and engagement in public life (Li *et al.* 2012). However, in winter conditions, such elements are often obscured by slush, snow or water, making them difficult to navigate (Morales *et al.* 2014).

We found that bulky winter clothing posed a barrier to manoeuvring in winter conditions for youths with disabilities; in contrast, it enabled time spent outside for typically developing youths. Similarly, past research among adults has found that physical limitations posed challenges to putting on and removing winter clothing (Green *et al.* 2011). Although our participants did not report such challenges, youths with disabilities did note how the bulkiness of winter clothing restricted their movement and ability to manoeuvre their wheelchairs. More research is needed on adaptive winter clothing, which can help preserve independence (Banks 2001).

We also found that youths with disabilities encountered more barriers in leaving their homes during winter. Past research has found that snow or ice often keeps people inside (Li *et al.* 2012), which is consistent with our findings among youths with disabilities but not their typically developing peers. Evidence shows that precipitation, cold weather and wind are deterring factors to physical activity throughout Canada and Northern United States (Tucker & Gilliland 2007). More research is needed on how weather affects participation and inclusion among youths with disabilities in particular.

Youths with disabilities reported negative psychosocial impacts of winter, including frustration, loneliness, boredom and increased dependence, compared with typically developing youths. This is consistent with previous research showing that weather can pose barriers to participation in everyday activities and be linked with psychosocial difficulties, especially loneliness and depression (Lindsay & Yantzi 2014). Somewhat surprisingly, none of our participants with disabilities directly mentioned depression; however, this is an area of concern given their increased social isolation and reduced independence during winter (Bower 1997; House 2001; Lindsay & Yantzi 2014).

At the same time, youths with disabilities also displayed ways of adapting to winter. This is consistent with past research, which has found that youth with disabilities display resiliency when interacting with their environments (Lindsay & Yantzi 2014).

Our study was limited by its small sample size, and our findings are not generalizable to all youths with disabilities. Nevertheless, given our aim to provide a rich understanding of youths' experiences of winter, our sample size and use of a comparison group were consistent with qualitative methodology (Grbich 2007). As a second limitation of our study, participants with disabilities varied in their types of disability and types of power wheelchair used. This may have influenced their respective abilities to participate in winter activities. Future research should compare winter experiences between youths with varying disability types, assistive mobility devices and geographic locations. Further work is needed to explore the

important role of the natural environment on activity and participation among youth with disabilities.

Conclusion

Youths with disabilities experienced many similar challenges in winter, such as health and safety concerns and accessibility issues, compared with typically developing peers – but gave more examples. Youths with disabilities encountered challenges in going outdoors during winter and reported negative psychosocial impacts, including loneliness and increased dependence. They also reported several adaptive strategies to cope with the challenges faced. These findings highlight the importance of considering weather and climate in promoting the participation and inclusion of youths with disabilities, as mandated under the United Nations Convention on the Rights of Persons with Disabilities and the Convention of the Rights of the Child (article 23).

Key messages

- Youths with disabilities encountered similar challenges to typically developing peers in winter, but often had fewer options for overcoming them.
- Bulky winter clothing and mitts posed barriers to outdoor movement for youths with disabilities, while enabling the activities of typically developing peers.
- Youth with disabilities experience 'seasonal dependence', having less freedom and requiring more support from others in winter.
- It is important to help youth with disabilities participate in social and recreational activities during winter. Clinicians working with youth who use wheelchairs in winter should be cognizant of signs of loneliness, isolation and depression and should connect them to appropriate supports.

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References

Alaszewski, A. (2006) *Using Diaries for Social Research*. Sage, London, UK.

Banks, K. (2001) Adaptive clothing – preserves independence and assists the caregiver. *Lippincott's Case Management*, **6**, 243–245.

Bell, M., Golberg, R., Hogrefe, C., Kinney, P., Knowlton, K. & Lynn, B. (2007) Climate change, ambient ozone, and health in 50 US cities. *Climatic Change*, **82**, 61–76.

Beynon, C., Wyke, S., Jarman, I., Robinson, M., Mason, J., Murphy, K., Bellis, M. A. & Perkins, C. (2011) The cost of emergency hospital admissions for falls on snow and ice in England during winter 2009/2010. *Environmental Health*, **10**, 60.

Bower, B. (1997) Social links may counter health risks: research on how social isolation affects mortality in older adults. *Science News*, **152**, 135.

Capello, M. (2005) Photo interviews: Eliciting data through conversation with children. *Field Methods*, **17**, 170–182.

Environment Canada (2000) *National Climate Data and Information Archive: Canada Climate Normal or Average, 1971–2000*. Environment Canada, Ottawa, Canada.

Forsyth, R. & Jarvis, S. (2002) Participation in childhood. *Child: Care, Health, & Development*, **28**, 277–279.

Gibson, B., Smith, B., Yoshida, K., Abbott, D., Mistry, B., Lindsay, S. & Hamdani, Y. (2013) The integrated use of audio diaries: photography and interviews in research with disabled young men. *International Journal of Qualitative Methods*, **12**, 383–402.

Grbich, C. (2007) *Qualitative Data Analysis*. Sage, London, UK.

Green, S., Boger, J. & Mihailidis, A. (2011) Toward enabling winter occupations: testing a winter coat designed for older adults. *Canadian Journal of Occupational Therapy*, **78**, 57–64.

House, J. (2001) Social isolation kills, but how and why? *Psychosomatic Medicine*, **63**, 273–274.

Intergovernmental Panel on Climate Change (IPCC) (2007) A report of the working group on intergovernmental panel on climate change. M. Parry, O. Canziani, JP. Palutikof, P. van der.

Jacelon, C. & Imperio, K. (2005) Participant diaries as a source of data in research with older adults. *Qualitative Health Research*, **15**, 991–996.

Jurkowski, J. (2008) Photovoice as participatory action research tool for engaging people with intellectual disabilities in research and program development. *Journal of Intellectual Disability Research*, **46**, 1–11.

Law, M., King, G., King, S., Kertoy, M., Hurley, P., Rosenbaum, P., Young, N. & Hanna, S. (2006) Patterns of participation in recreational and leisure activities among children with complex physical disabilities. *Developmental Medicine & Child Neurology*, **48**, 337–342.

Lemaire, E., O'Neill, P., Desroisiers, M. & Robertson, G. (2010) Wheelchair ramp navigation in snow and ice-grit conditions. *Archives of Physical Medicine and Rehabilitation*, **91**, 1516–1523.

Li, Y., Hsu, J. & Fernie, G. (2012) Aging and the use of pedestrian facilities in winter: the need for improved

design and better technology. *Journal of Urban Health*, **90**, 602–615.

Lindsay, S. & McPherson, A. (2012) Experiences of social exclusion and bullying at school among children and youth with cerebral palsy. *Disability & Rehabilitation*, **34**, 101–109.

Lindsay, S. & Yantzi, N. (2014) Weather, disability, vulnerability and resilience: Exploring how youth with a physical disability experience winter. Disability and Rehabilitation, doi: 10.3109/09638288.2014.892158 [Epub ahead of print].

Morales, E., Gamache, S. & Edwards, G. (2014) Winter: public enemy #1 for accessibility: exploring new solutions. *Journal of Universal Design and Accessibility*, **4**, 29–51.

QSR International (2012) NVIVO (version 10) (software). Retrieved from http://www.qsrinternational.com/products_nvivo.aspx (last accessed 2 October 2013).

Rosenbaum, P. (2007) The environment and childhood disability: opportunities to expand our horizons. *Developmental Medicine & Child Neurology*, **49**, 643.

Stakes, R. E. (2000) Case studies. In: *Handbook of Qualitative Research*, 2nd edn (eds N. K. Denzin, Y. S. Lincoln), pp. 435–455. Sage, Thousands Oaks, CA, USA.

Statistics Canada (2008) *Participation and Activity Limitation Survey*. Statistics Canada, Ottawa, Canada.

Tucker, P. & Gilliland, J. (2007) The effect of season and weather on physical activity: a systematic review. *Public Health*, **121**, 909–922.

Vreeman, R. & Carroll, A. (2007) A systematic review of school-based interventions to prevent bullying. *Archives of Pediatric and Adolescent Medicine*, **161**, 78–88.

Wee, J. (2007) *Factors affecting activities and participation in persons with disabilities*. (MSc Thesis). Queens University, Kingston, Canada.

World Health Organization (WHO) (2001) *International Classification of Functioning, Disability and Health*. World Health Organization, Geneva. Available at: http://www.who.int/classifications/icf/en/ (last accessed 2 October 2013).