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ORIGINAL RESEARCH

Barriers to Wheelchair Use in the Winter

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Abstract

Objectives: To test the hypothesis that challenges to community participation posed by winter weather are greater for individuals who use scooters, manual and power wheelchairs (wheeled mobility devices [WMDs]) than for the general ambulatory population, and to determine what WMD users identify as the most salient environmental barriers to community participation during the winter.

Design: Cross-sectional survey organized around 5 environmental domains: technological, natural, physical, social/attitudinal, and policy.

Setting: Urban community in Canada.

Participants: Convenience sample of WMD users or their proxy (N=99).

Interventions: Not applicable.

Main Outcome Measures: Not applicable.

Results: Forty-two percent identified reduced outing frequency in winter months, associated with increased age ($\chi^3=6.4$, $P=.04$), lack of access to family/friends for transportation ($\chi^2=8.1$, $P=.04$), and primary type of WMD used in the winter (scooter $\chi^2=8.8$, $P=.003$). Most reported tires/casters becoming stuck in the snow (95%) or slipping on the ice (91%), difficulty ascending inclines/ramps (92%), and cold hands while using controls or pushing rims (85%); fewer identified frozen wheelchair/scooter batteries, seat cushions/backrests, or electronics. Sidewalks/roads were reported to be problematic by 99%. Eighty percent reported needing additional help in the winter. Limited community access in winter led to a sense of loneliness/isolation, and fear/anxiety related to safety. Respondents identified policies that limited participation during winter.

Conclusions: People who use WMDs decrease their community participation in cold weather because of multiple environmental barriers. Clinicians, researchers, and policymakers can take a multidimensional approach to mitigate these barriers in order to enhance community participation by WMD users in winter.

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Participation refers to the ability of a person to be involved in any life situation,[1] and "occurs at the intersection of what the person can do, wants to do, has the opportunity or the affordance to do, and is not prevented from doing by the world in which the person lives and seeks to participate."[2(pS30)] Participating in self-defined, meaningful activities can enhance an individual's sense of competence and well-being, both of which are essential for healthy emotional, psychological, and skills-based development.[3] Community participation, which encompasses accessing community spaces, activities, and social relationships,[4] is more closely related to life satisfaction than illness or impairment for people with disabilities.[5] To develop strategies to maximize community participation for people with disabilities, there is a need to explore the barriers to participation.

In Canada, 1.2 million people need or use mobility aids to participate in their community and society.[6] Wheeled mobility devices (WMDs), such as wheelchairs, are 1 category of mobility aids. While more homes, schools, and community-based facilities are incorporating accessibility features, users of WMDs continue to experience barriers to their community participation.[4,7-10] Furthermore, the existence of snow, ice, and cold temperatures characteristic of the winter months in some locations create additional challenges. Although community participation issues posed by winter are genuine concerns for all residents, they are compounded for users of WMDs.[11,12]

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Cited barriers to WMD use in the winter include cold temperatures,[13,14] ice- and snow-covered roads and sidewalks,[15-19] frozen wheelchair system components,[14] reduced wheelchair battery life,[16,18] decreased manual dexterity and strength for operating controls,[14,19] and risk of thermal injury.[14,16] However, there is a lack of research exploring the details and processes of winter weather barriers or of service and policy-related barriers. Since accessibility issues are multifaceted, it is important to explore winter weather barriers inherent in WMDs, and in the built, social, and policy environments in order to identify areas that are amenable to change.

A biopsychosocial model of disability, the *International Classification of Functioning, Disability and Health*,[1] guided this research. In particular, exploring the role of the environment in restricting societal participation was foundational.[1,20] The research question was as follows: What do people who use WMDs identify as the most salient environmental barriers to community participation in the winter? The findings of this research are intended to identify winter weather issues of the greatest impact on WMD users' community participation that can inform future research.

Methods

Design

The researchers developed a survey (available from the corresponding author), based on a literature review of WMD winter/cold weather issues, and issues generated by the researchers (health care professionals/researchers with experience working with WMD users). Closed-ended (fixed choice and Likert scale) and open-ended questions were developed and organized around the following 5 environmental domains identified in the *International Classification of Functioning, Disability and Health*[20]: technological, natural, physical, social/attitudinal, and policy (appendix 1). Seven people participated in a pilot study of utility and content validity, and the survey was subsequently modified to add questions, improve wording clarity, and increase response ease. The survey was administered online using SurveyMonkey,[a] with an option for telephone or mail-in administration. A university-based research ethics board approved the study; all participants provided informed consent.

Sample

The study was conducted in Manitoba, Canada, where Winnipeg (the provincial capital) experiences average winter temperatures well below 0°C and a yearly average snowfall of 113.7cm.[21] While the total provincial population is 1.2 million people,[22] the actual number of WMD users is unknown. Recruitment consisted of circulating a poster advertising the study to clinics and organizations that provide services to WMD users, and organizations shared study information via their established communication mechanisms (eg, e-mail, newsletter). All survey respondents were a part- or full-time WMD user (wheelchair or scooter), or a caregiver of the WMD user (as proxy respondents), Manitoba residents, and English speaking. Long-term care facility residents were excluded since we anticipated their community participation experience to be unique. The survey was open over the span of 2 winters (December 2011 through May 2012, and January through May 2013).

List of abbreviations:

WMD **wheeled mobility device**

Data analysis

Survey data were imported into SPSS version 22[b] for descriptive analysis (frequencies) and analysis of the hypothesis that maintained outing frequency would be associated with participants who were younger, had access to private transportation, used a power wheelchair, lived with others, and reported a longer duration of wheelchair use. Frequency of outing data were dichotomized into "frequent" (defined as 3−6 times/wk and everyday) or "infrequent" (<3 times/wk) outings. All demographic data were categorical. The chi-square statistic ($P<.05$, 2-tailed) was used to determine the association of the change in frequency of outing with the demographic variables. Verbatim responses to the open-ended questions were imported into a Word document.[c] Directed content analysis[23] was conducted by the first author and a research assistant whereby written responses were coded with a shorthand phrase that captured the statement intent, and similar codes were grouped into overarching categories within each of the 5 environmental domains. Confirmation of category assignment was conducted by the second author.

Results

Ninety-nine respondents completed the survey (1 responded through mail-in); not all respondents answered all the questions. Demographic and social characteristics of survey respondents are shown in table 1. Analysis of the responses to the open-ended questions yielded additional explanatory findings within each environmental domain and are discussed in the respective sections below.

Respondents indicated the frequency with which they used their WMDs to go outdoors/into the community in the summer and in the winter (fig 1). When comparing summer and winter outing frequency, 42.4% indicated reducing their outing frequency in winter months.

Technology/equipment

Respondents were asked to identify winter-related technology/equipment challenges. Most reported that their tires/casters became stuck in the snow (95.1%; n=82 responses). Difficulty ascending inclines/ramps (91.8%; n=85 responses), and tires or casters slipping on the ice (90.9%; n=77 responses) were frequently reported. Respondents reported cold hands while using controls or pushing rims (85.3%; n=75 responses). Fewer respondents identified frozen wheelchair/scooter batteries (38.6% of 44 responses), frozen seat cushions/backrests (30.9% of 68 responses), or frozen electronics (23.2% of 43 responses) as problematic. Reduced outing frequency was associated with scooter use ($\chi^2=8.8$, $P=.003$), whereas no change in frequency of outings was reported by those who identified they primarily used a power wheelchair ($\chi^2=3.7$, $P=.05$) or manual wheelchair ($\chi^2=.13$, $P=.9$) in the winter. While decreased outing frequency was associated with increased age ($\chi^2=6.4$, $P=.04$), it was not associated with duration of WMD use ($\chi^2=2.8$, $P=.4$). The detrimental effect of cold temperature was summed up by 1 power wheelchair user: "Too cold to even go out due to