Measuring outdoor walking during supervised sessions in the Getting Older adults OUTdoors (GO-OUT) multi-centre study

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Abstract

Treatment fidelity is the extent to which interventions are delivered as intended. Maintaining a high degree of fidelity is important to ensure internal and external validity of the results. Because most randomized controlled trials do not determine treatment fidelity, many ineffective interventions may be disseminated as being effective. The purpose of this study was to analyze the fidelity of supervised outdoor walking sessions included in the Getting Older adults OUTdoors (GO-OUT) study. Walking sessions occurred twice weekly for ten weeks in this study. Quantitative (GPS devices, activity monitors, implementation fidelity form, and process indicators form) and qualitative tools (reflective notes, analysis of project documentation, and observation of one walking session) were used to determine fidelity of treatment delivery, provider training, and study design. Equivalence testing was used to analyze gait and physical activity parameters achieved by older adults during two walking sessions (session 1, week 3 and session 1, week 9) compared to the protocol set for those sessions. Paired t-tests were also conducted to compare participants' achievements in week 3 and week 9. Analyzing fidelity of treatment delivery, it was observed that all the activities planned for each walking session were performed, attendance rates were high, and participants followed the progressiveness of the protocol. Even though the researchers followed many recommendations from the literature to maintain a high degree of fidelity of provider training, some aspects of the training could have been improved. Finally, in terms of fidelity of study design, the protocol tested the hypotheses of the study, standardized documents were developed to ensure the walking leaders were informed of the most important aspects of the protocol, and the theory that informed the development of the protocol was reviewed during the training of the walking leaders. In conclusion, since most randomized controlled trials do not report on fidelity, this study represents a positive contribution to the physical therapy literature. The study provides specific information about measuring fidelity during a walking intervention trial and reports on the varying levels of fidelity that were achieved.

Keywords: fidelity, older adults, outdoor walking sessions.

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Introduction

Fidelity, characterized as the confirmation that an intervention was conducted as per protocol (Moncher & Prinz, 1991), provides a measure of the degree of internal validity and external validity of the results (Borrelli et al., 2005). Studies have shown that interventions that are delivered with a high degree of fidelity are more effective (Rovniak, Hovell, Wojcik, Winett, & Martinez-Donate, 2005; Windsor, Clark, Davis, Wedeles, & Abroms, 2017) and have lower attrition rates (Noel, 2006).

Although fidelity evaluations are relevant and necessary, most randomized controlled trials do not report on fidelity (Lambert et al., 2017; Moncher & Prinz, 1991). The purpose of my study was to evaluate fidelity of supervised outdoor walking sessions included in a multicentre randomized controlled trial (GO-OUT study). The Getting Older adults OUTdoors (GO-OUT) study has been designed to compare the effectiveness of a 10-week outdoor community mobility intervention plus a one-day educational workshop to the effectiveness of weekly reminders with tips on how to improve outdoor walking plus a one-day educational workshop in older adults (≥ 65 years) with an outdoor community mobility limitation. This type of fidelity evaluation is important because the majority of studies to-date that aimed to improve physical activity (PA) in younger and older adults have not measured treatment fidelity (Lambert et al., 2017). In addition, no randomized controlled trials have specifically determined the fidelity of treatments aimed to improve outdoor mobility in older adults.

Outdoor PA is important for older adults because it helps to improve mental wellbeing (Thompson Coon et al., 2011) and increase minutes of moderate-to-vigorous physical activity (MVPA) (Kerr, Sallis, et al., 2012), which is associated with a lower risk of coronary heart disease (Tanasescu et al., 2002), dependency (Marques et al., 2014) and mortality (Gebel et al., 2015). The issue is that many older adults may not leave the home (Smith, Chen, Clarke, & Gallagher, 2016) and perform PA outdoors frequently (Simonsick, Guralnik, Volpato, Balfour, & Fried, 2005). Therefore, effective treatments to improve outdoor mobility in older adults are needed. In addition, the research designed to assess these treatments should include fidelity evaluations to confirm what aspects of the implementation lead to the results achieved post-intervention (Paulson, Post, Herinckx, & Risser, 2002).

Background Information

Community Mobility in Older Adults

Community mobility, defined as the ability to move independently outside the home or residence, is important for older adults to maintain independence and quality of life (Patla & Shumway-Cook, 1999). Many older adults report that community mobility is relevant for participation in the community, such as working and engaging in leisure and religious activities (Ramachandran & D'Souza, 2016). To be able to move safely in the community, older adults must be able to adapt to environmental characteristics, so they do not become challenges that interfere with mobility (Patla & Shumway-Cook, 1999).

Patla and Shumway-Cook (1999) developed a framework in which they proposed eight environmental characteristics, which they called dimensions of mobility, that may limit community mobility in older adults. The dimensions of mobility included time constraints (e.g., crossing the street), external loads (e.g., carrying bags while walking), distances to reach places, different terrain, traffic levels (e.g., walking through a crowd), attentional demands (e.g. walking and talking to another person), ambient conditions (poor lighting and inclement weather), and postural transitions (e.g., stopping suddenly for a car and changing direction). This framework informed the design of the GO-OUT walking sessions, in which participants learned how to adapt to these environmental characteristics. In addition, Lord et al. (2010) reported that older adults must have good motor control, attention and self-efficacy, and the ability to perform cognitive and motor tasks simultaneously to be able to safely walk independently in the community. If older adults feel they cannot adapt to environmental features, they may avoid leaving the home (Patla & Shumway-Cook, 1999). For example, older adults who have a low self-efficacy for daily activities and for health promotion (Kono, Kai, Sakato, & Rubenstein, 2004) and who are afraid of falling (A. R. Smith et al., 2016) leave the home less frequently than those with better self-efficacy and no fear of falling.

Leaving the home less frequently may lead older adults to achieve fewer daily steps and minutes of MVPA (Davis et al., 2011), experience a greater loss of physical function (Jacobs et al., 2008; Kono et al., 2004) and self-efficacy for daily activities and health promotion (Kono et al., 2004), have a higher risk of institutionalization and disability (Fujita, Fujiwara, Chaves, Motohashi, & Shinkai, 2006), and have a lower probability of recovery from disability (Fujita et al., 2006). Mobility disability, the inability to move independently in the community and the home (Patla & Shumway-Cook, 1999), is associated with an increased risk of dependency (Hirvensalo, Rantanen, & Heikkinen, 2000), mortality (Hirvensalo et al., 2000) and depression (Bruce, 2001), less social participation (Holmgren, Lindgren, de Munter, Rasmussen, & Ahlström, 2014), and increased risk of social isolation (Chatters, Taylor, Nicklett, & Taylor, 2018). Evidence shows that social isolation may predict falls in older adults (Pohl, Cochrane, Schepp, & Woods, 2018) and that weaker ties with family and friends may be associated with rehospitalization (Valtorta, Moore, Barron, Stow, & Hanratty, 2018). Therefore, community mobility is important for older adults to maintain physical and mental health and functional independence.

Life-Space Mobility

Life-space tools provide a measure of how often and how far individuals move in the home and the community considering frequency and level of independence (Baker, Bodner, & Allman, 2003). Not surprisingly, evidence shows that greater life-space mobility may be related to lower depression rates (Xue, Fried, Glass, Laffan, & Chaves, 2007), increased cognitive function (Xue et al., 2007), and better quality of life (Rantakokko et al., 2016). These findings reinforce the importance of older adults going to the community more frequently and moving through greater life-spaces.

A prospective cohort study demonstrated that participants who moved through greater life-spaces (e.g., moving beyond the neighbourhood) performed more minutes of PA and walked at faster gait speeds (Mackey et al., 2014). Portegijs et al. (2015) observed that, over a period of 7 days, older adults who had a greater life-space achieved more minutes of moderate PA and step counts and spent less time in sedentary behaviour compared to participants who had a more restricted life-space. In addition, Dewulf et al. (2016) conducted a cross-sectional study and observed that individuals who moved beyond the neighbourhood spent less time being sedentary and performed more minutes of MVPA compared to individuals who only moved in the neighbourhood. These findings are important because evidence shows that older adults who spend fewer minutes in sedentary behaviour may demonstrate better physical function and quality of life, more satisfaction with life, less fear of falling, and lower cognitive decline and risk of mortality (Copeland et al., 2017). In addition, performing more minutes of MVPA is associated with a lower risk of coronary heart disease (Tanasescu et al., 2002), dependency (Marques et al., 2014) and mortality (Gebel et al., 2015). Over time, older adults with a greater life-space mobility may demonstrate a lower risk of developing frailty (Xue et al., 2007), a lower risk of being institutionalized (Sheppard, Sawyer, Ritchie, Allman, & Brown, 2013), and lower mortality (Boyle, Buchman, Barnes, James, & Bennett, 2010; Mackey et al., 2014). Frailty, characterized by weight loss, fatigue, low levels of PA, slowness, and poor muscle strength (Bandeen-Roche et al., 2006), may lead to disability (Shimada, Makizako, Doi, Tsutsumimoto, & Suzuki, 2015), which predicts dependency in older adults (Hirvensalo et al., 2000) and higher healthcare expenditures (Carey, Robine, Michel, & Christen, 2005). Additionally, older adults usually wish to age in place to maintain autonomy and social contacts; they appreciate the sense of familiarity of both the environment they live in and the neighbours they socialize with (Wiles, Leibing, Guberman, Reeve, & Allen, 2012). Therefore, to maintain health and independence for as long as possible and thus be able to age in place with a good quality of life, older adults must be able to participate safely and independently in activities in the community.

Community Mobility Indoors and Outdoors

Outdoor community mobility such as walking in parks may be more important for some aspects of health than indoor community mobility, such as walking in malls. Many studies have shown the health benefits of spending time outdoors and performing PA outdoors for younger and older adults. Coon et al. (2011) observed that younger adults who exercised outdoors reported better mental wellbeing compared to those who performed PA indoors. Kerr and Sallis et al. (2012) demonstrated that older adults who performed PA outdoors achieved more minutes of MVPA than those who were only active indoors. Spending time in green spaces (neighbourhoods with trees, other vegetation and parks) has also been shown to be related to more minutes of light PA and MPVA in late middle-aged adults (Dewulf et al., 2016) and better health and wellbeing in younger and older adults (Hartig, Mitchell, de Vries, & Frumkin, 2014) compared to individuals who spend more time in non-green areas. This could be explained by better air quality, more social cohesion, lower stress levels, and more minutes of outdoor PA compared to individuals who do not have as much contact with nature (Hartig et al., 2014). Therefore, outdoor PA is important to increase contact with both nature and people and to maintain or improve physical and mental health and wellbeing.

In addition to performing PA outdoors and spending time outdoors, evidence shows that the amount of time spent outdoors, and the amount of time spent performing PA outdoors is also relevant for health. Simonsick et al. (2005) observed that older women who walked at least eight blocks per week had a lower mortality risk and better health and physical function than those who walked less than eight blocks per week. In addition, participants who spent at least 30 minutes per day either being outdoors or performing PA (indoors or outdoors) were more likely to have fewer depressive symptoms, less fear of falling, and better physical function than individuals who did not spend time outdoors nor engaged in PA (Kerr, Marshall, et al., 2012). The only difference between older women who spent more than 30 minutes per day outdoors and individuals who spent more than 30 minutes performing PA was cardiorespiratory fitness, which was higher in individuals who spent time in PA (Kerr, Marshall, et al., 2012). Thus, spending time outdoors may be as relevant as performing PA for some variables, but spending time on both, such as walking outdoors, may bring even greater health benefits. Although there is evidence to show the benefits of outdoor mobility in older adults, more studies are needed to evaluate the health benefits of regularly engaging in PA outdoors. Additionally, these findings reinforce that spending time outdoors and performing PA outdoors may improve physical and mental health in older adults, but that the time that is dedicated to these activities may also determine the extent of the health benefits.

Barriers to Outdoor Community Mobility

Although research has established many benefits of spending time outdoors, participating in community events and engaging in PA outdoors, many barriers may potentially limit outdoor community mobility in older adults.

Environmental Barriers.

Neighbourhood walkability. Neighbourhood walkability is a measure of the extent to which neighbourhoods support active transport (walking and cycling as a means of transportation) (Saelens, Sallis, & Frank, 2003). High walkable neighbourhoods usually have high population density, a mixture of commercial, residential and green spaces, high street connectivity, and adequate sidewalks and bike lanes (Saelens, Sallis, & Frank, 2003). Gell et al. (2015) conducted a cross-sectional study with individuals 50 years of age and older with mobility disability (individuals who needed an assistive device to walk). They observed that participants who lived in high walkable neighbourhoods, with higher population density and street connectivity, walked more as a means of transportation than similar individuals who lived in low walkable neighbourhoods. In addition, Portegijs et al. (2017) found that participants living in high walkable neighbourhoods had higher step counts than those living in low walkable neighbourhoods, which indicates that older adults walk more when they live in a supportive environment.

In addition to analyzing active transportation, King et al. (2011) and Chudyk et al. (2017) evaluated leisure activities outdoors (outdoor PA, such as walking and cycling during leisure-time) and levels of MVPA. They observed a positive association between neighbourhood walkability and active transportation in older adults, but there was no association between neighbourhood walkability and leisure activities outdoors nor between walkability and levels of

MVPA. The authors proposed that, as opposed to older adults who live in low walkable neighbourhoods, individuals who live in high walkable neighbourhoods may feel more interested in using walking as a means of transportation; maybe because the walking distance to amenities is lower, sidewalks are better preserved, and area aesthetics are more pleasant. However, for some older adults, walk-friendly environments may not be enough to motivate them to participate in leisure activities outdoors. Similarly, low walkable neighbourhoods may not necessarily discourage leisure PA outdoors since older adults may perform these activities in other places that may feel more safe (e.g., outside of their neighbourhood).

Neighbourhood environmental characteristics. Environmental characteristics such as long distances to amenities, high curbs, hills, vehicles on sidewalks (e.g., service vans), and dangerous crossroads may be associated with restricted life-space mobility in older adults (Merja Rantakokko, Iwarsson, Portegijs, Viljanen, & Rantanen, 2015). In other words, older adults may stay at home more often and restrict their life-space because of these environmental barriers. Rantakokko et al. (2017) observed that the most reported environmental barriers to outdoor PA were snow and ice, hills, cyclists on sidewalks, poor condition of streets, and absence of resting places. Participants who reported more barriers at baseline, presented a higher decline in sense of autonomy outdoors two years later, which may be associated with greater restriction in life-space mobility (Portegijs, Rantakokko, Mikkola, Viljanen, & Rantanen, 2014).

On the other hand, Saris et al. (2013) found that the only environmental characteristic that was related to active transport was perceived traffic speed. Individuals who perceived traffic speed as being slower engaged more in active transportation. In addition, Etman et al. (2016) found no association between active transport and objectively measured neighbourhood safety, amenities, and functional characteristics. Only pleasant aesthetics in the area up to 800 metres and 1200 meters around participants' homes was related to more minutes of transport activity. Thus, participants who lived in neighbourhoods with better aesthetics within 800 metres and 1200 metres from their homes performed more minutes of active transportation than participants who lived in areas with lower aesthetics scores. The authors also found that older adults who lived in areas with high aesthetics scores 400 metres around the home had fewer disabilities in instrumental activities of daily living. These findings indicate that older adults may feel more motivated to walk further when area aesthetics are maintained for longer distances, but they may lack the motivation to leave the home when they live in neighbourhoods with low aesthetics scores immediately around their home.

The lack of association between the other environmental characteristics (access to services, safety, amenities, and functional characteristics) and active transport may be explained by the fact that these two studies (Etman et al., 2016; Saris et al., 2013) were conducted in the Netherlands, which is a European country that was mostly built before our current "car culture" became entrenched. In general, the Netherlands is naturally more walkable than Canada and the USA. Consequently, some environmental characteristics may not have been related to transport activity because many participants (those who engaged in active transportation and those who did not) lived in safe neighbourhoods with amenities nearby connected with appropriate walking and cycling trails. Therefore, other barriers (e.g., intrinsic barriers such as poor physical function) may have affected the engagement in transport activity more than environmental characteristics in this population.

A review article analyzing neighbourhoods from the USA observed that many environmental characteristics, such as residential areas with no commercial land use, poor street connectivity, high distances to amenities, inappropriate sidewalks and bike lanes, and low population density affected walking and bicycling as a means of transportation in younger and older adults (Saelens, Sallis, & Frank, 2003). Therefore, the literature indicates that some environmental characteristics may limit outdoor mobility in older adults, which can potentially lead to health problems, such as disabilities (Etman et al., 2016). The characteristics that affect outdoor mobility in older adults may vary among countries, as Canada and the USA may present more problems regarding distances to amenities and street connectivity (e.g., long block sizes and not enough route choices) compared to some European cities.

Neighbourhood income. Neighbourhood income is usually characterized as low or high based on median income, poverty rates, and percentages of residents living on low income (Reardon, Fox, & Townsend, 2015). It has been found that older adults who live in low-income neighbourhoods perform fewer minutes of leisure activities outdoors and MVPA (indoors and outdoors) compared to older adults who live in high-income neighbourhoods (King et al., 2011). One explanation for this relationship may be that older people living in low-income neighbourhoods may be less likely to have a car (Paulley et al., 2006), which has been shown in some studies to negatively affect PA levels. Older adults who do not have a car achieve fewer minutes of MVPA, fewer steps (Zandieh, Martinez, Flacke, Jones, & van Maarseveen, 2016) and have a more restricted life-space mobility (Portegijs et al., 2015) compared to individuals who have a car. Additionally, older adults living in low-income neighbourhoods may perceive the neighbourhood as being less safe, as having worse aesthetics, and as being noisier, which may negatively influence levels of outdoor PA (Zandieh et al., 2016). The reasons why older adults feel unsafe may be due to high crime rates, vandalism, homeless people and graffiti in the neighbourhood (Mahmood et al., 2012).

In terms of active transportation, while King et al. (2011) observed no associations between neighbourhood income and active transportation in older adults, Saris et al. (2013) found that individuals living in deprived neighbourhoods walked more as a means of transportation. Although these findings are unclear, individuals who live in low-income neighbourhoods may not have cars (Paulley et al., 2006) and thus, rely more on active transportation. Chudyk et al. (2017) found that older adults who did not have a car used walking as a means of transportation to a much greater extent compared to individuals who had cars. Although findings on neighbourhood income are still unclear, it appears that living in high-income neighbourhoods is more beneficial in terms of PA outdoors than living in low-income neighbourhoods since overall levels of PA outdoors are higher for older adults living in high-income neighbourhoods (Zandieh et al., 2016). Even though older adults who have a car may engage less in transport activity, they may compensate for that by performing more minutes of leisure PA outdoors.

Individual Barriers. In addition to environmental barriers, many individual factors may influence levels of outdoor PA in older adults. Studies show that older age, female sex, fewer years of education, poor cognitive function, worse financial situation, greater number of chronic conditions and walking difficulties (Merja Rantakokko et al., 2015), more lower-extremity physical limitations (Portegijs et al., 2017), lower gait speed (Merja Rantakokko et al., 2009), and low self-efficacy (Sessford, Jung, Brawley, & Forbes, 2015) may act as barriers to outdoor mobility in older adults. In this paper, only the modifiable individual barriers will be discussed.

Poor physical function. Portegijs et al. (2017) observed that lower-extremity physical limitations attenuated the relationship between perceived facilitators to PA and self-reported PA. In other words, participants with poor physical function perceived the same number of facilitators for PA outdoors but performed less PA outdoors compared to individuals with better physical function. However, in this study, the researchers did not measure perceived barriers in the environment, and it is possible that perceived barriers limit outdoor activity more than facilitators may motivate it. Rantakokko et al. (2015), for example, observed that participants who perceived more barriers than facilitators for PA were more likely to have a restricted life-space.

Older adults with slower gait speeds and more walking difficulties (including requiring assistance to walk) walk less frequently outdoors (Simonsick et al., 2005). In addition, individuals who report more difficulty walking 500 metres may have a more restricted life-space (Rantakokko et al., 2015). Portegijs et al. (2015) observed that older adults who reported walking difficulties moved less frequently beyond their neighbourhood compared to participants with no walking difficulties. It has also been shown that older adults with poorer physical function spend fewer minutes per day outdoors or performing PA (indoors or outdoors) than individuals with better physical function (Kerr, Marshall, et al., 2012). One explanation for this finding is that individuals with poorer physical function may think they cannot adapt to the environment (Patla & Shumway-Cook, 1999) and therefore they choose to perform PA indoors (Kerr, Sallis, et al., 2012), while individuals with better physical function may choose to perform PA outdoors (Kerr, Sallis, et al., 2012).

Fear. Fear of falling and of moving outdoors may also be barriers to outdoor mobility in older adults and may be a result of several factors. Some of the predictors of fear of falling are female sex, depression, chronic diseases, limitations in instrumental activities of daily living, and falls history (Dierking, Markides, Snih, & Peek, 2016; Oh, Hong, Lee, & Han, 2017). Rantakokko et al. (2009) observed that older adults who reported being afraid of moving outdoors lived in neighbourhoods with poor street conditions, hills in the nearby environment and noisy traffic. Additionally, these older adults who were afraid of moving outdoors had more musculoskeletal diseases and a lower gait speed compared to individuals who were not afraid of moving outdoors. Therefore, many intrinsic and extrinsic factors may cause older adults to feel afraid of falling and moving outdoors.

Evidence shows that fear of falling is associated with a more restricted life-space mobility (Auais et al., 2017) and activity restriction in older adults (Friedman, Munoz, West, Rubin, & Fried, 2002). Jefferis et al. (2014) observed that older men who were afraid of falling took significantly fewer steps per day, spent fewer minutes in light PA and MVPA, and spent more minutes being sedentary compared to men who were not afraid of falling. Older adults who are afraid of moving outdoors may have a higher risk of developing walking difficulties (Merja Rantakokko et al., 2009) and those afraid of falling outdoors may have four times the risk of being homebound (A. R. Smith et al., 2016) compared to older adults who are not afraid of falling and moving outdoors. Therefore, fear may cause older adults to restrict their life-space and avoid participating in activities in the community, which can then lead to walking difficulties and functional dependency.

Low self-efficacy. Older adults with low self-efficacy for daily activities and for health promotion leave the home less frequently compared to individuals with greater self-efficacy (Kono et al., 2004). Sessford et al. (2015) conducted an observational study in which they tested participants in 6 walking tasks in their own neighbourhood to simulate a normal walking routine. Tasks 1 and 2 were basic tasks in which participants walked 7 metres at their usual gait speed and 7 metres at a faster gait speed, respectively. In task 3, there were 2 obstacles (6 cm and 30 cm tall) for participants to step over while they walked 7 metres at a faster speed. Task 4 was similar to task 3 but participants wore sunglasses during the task. In task 5, participants walked 7 metres at their usual gait speed while they picked up 3 objects from the floor. Finally, participants walked 400 metres as fast as possible for task 6. The authors found that self-efficacy for community mobility predicted all walking tests, except the first one, which was the most basic task. Thus, the more complex the task is, the more important it is for older adults to have high self-efficacy scores (Sessford et al., 2015). When older adults walk outdoors, they have to overcome similar challenges and therefore, self-efficacy is an important outcome to target.

Walking enjoyment. Individuals who do not like to walk may perform fewer minutes of PA outdoors and accumulate fewer minutes of MVPA (Chudyk et al., 2017; Yu & Zhu, 2016), so it may be important for older adults to find outdoor activities to be fun and entertaining. Some of the factors that may influence walking enjoyment are peer support and a supportive environment (Yu & Zhu, 2016). Walking groups may be an effective approach, because they may increase participation and potentially motivate older adults to engage in PA outdoors over the long-term. Frequent walkers usually report that seeking social support and appropriate places to walk, such as green areas with walking routes, developing a walking plan that is realistic and easy to follow, and focusing on health benefits are effective strategies to maintaining outdoor walking activity (Duvall & De Young, 2013). Osuka et al. (2017) demonstrated that feeling part of a group and performing activities together may improve walking enjoyment, which could potentially improve adherence to walking programs.

Interaction Between the Individual and the Environment

Patla and Shumway-Cook (1999) developed a framework in which they discussed the role of the environment (social and built environment) and intrinsic factors (physical, mental, and psychological factors) in determining outdoor mobility in older adults. The authors suggested that when older adults walk outdoors, they must be able to manage distances, external loads such as carrying bags, poor lighting, inclement weather, different terrain conditions, differing traffic levels, postural transitions, attentional demands, and time constraints. These environmental characteristics were labelled dimensions of mobility in the framework. Older adults constantly interact with these dimensions when they are outdoors, and this interaction influences overall levels of outdoor mobility.

The importance of considering both the individual and the environment when trying to improve outdoor mobility in older adults has been demonstrated by many studies over the years (Benzinger et al., 2014; Clarke, Ailshire, Bader, Morenoff, & House, 2008; King et al., 2011). Clarke et al. (2008) observed that among individuals who lived in neighbourhoods with fair or poor street quality, those with mild or no physical impairment less frequently reported severe mobility disability compared to individuals with more severe physical impairments. Causal relationships could not be determined in this study, but it is likely that individuals who had poor physical function could not adapt to the unsupportive environment, which could have led them to avoid PA outdoors and then develop mobility disability. Many studies have shown that lack of PA can lead to mobility disability (Landi et al., 2007; Mankowski et al., 2017; Pahor et al., 2014). Additionally, King et al. (2011) observed that older adults who lived in low walkable neighbourhoods and had better physical function performed almost the same amount of active transportation (walking and cycling) in minutes per week as individuals who lived in high walkable neighbourhoods who had poorer physical function. In other words, one aspect may compensate for the other; older adults with poor physical function may benefit from living in high walkable neighbourhoods, and those who live in low walkable neighbourhoods but have good physical function may be able to adapt to the environment to maintain outdoor mobility.

The authors also found that older adults who lived in high walkable neighbourhoods and had better physical function achieved higher levels of transport activity compared to the rest of the sample. Thus, the combination of good intrinsic capacity and supportive environments may lead to higher levels of outdoor PA. These findings support the argument that the combination of environmental (e.g., net residential density, retail floor area ratio, land-use mix, intersection density) and intrinsic factors influence outdoor mobility in older adults.

Patla and Shumway-Cook (1999) also maintained that if older adults feel that they cannot adapt to the environment, they may avoid going outdoors. Thus, the interaction between the individual and the environment may lead older adults to either perceive the environment as challenging or adaptable, which may then motivate or discourage walking outdoors. For example, Portegijs et al. (2017) observed that older adults who lived in high walkable neighbourhoods perceived more environmental facilitators for outdoor PA than older adults who lived in low walkable neighbourhoods, which may then have motivated those in the walkable neighborhoods to leave the home more frequently.

Walking Interventions

A number of randomized controlled trials have tested the effectiveness of walking interventions in middle-aged and older adults. Most of the results have been positive. For example, adults who participated in walking programs demonstrated increased quality of life (Fisher & Li, 2004; Globas et al., 2012), gait speed (Drużbicki, Kwolek, Depa, & Przysada, 2010; Globas et al., 2012; Luft et al., 2008; Park, Oh, Kim, & Choi, 2011), cardiovascular fitness (symptom-limited maximal effort treadmill exercise test) (Luft et al., 2008), walking duration and standing time (Breyer et al., 2010), number of steps (using the walkway test) (Drużbicki et al., 2010), and daily step count (Takeda, Oka, Sakai, Itakura, & Nakamura, 2011). Researchers have also demonstrated improved walking performance (greater gait speed, gross and net energy cost, and relative effort) (Malatesta, Simar, Saad, Préfaut, & Caillaud, 2010), functional capacity (6MWT) (Globas et al., 2012; Negri et al., 2010), minutes of MVPA (Takeda et al., 2011), peak oxygen uptake (peak VO2) (Globas et al., 2012), balance (Globas et al., 2012), and mobility and knee symptoms (Segal et al., 2015) in these groups. Some of these studies involved training on a treadmill (Drużbicki et al., 2010; Globas et al., 2012; Luft et al., 2008; Malatesta et al., 2010; Segal et al., 2015) and others involved walking outdoors (Breyer et al., 2010; Fisher & Li, 2004; Negri et al., 2010; Park et al., 2011; Takeda et al., 2011). However, none of the studies that analyzed the effectiveness of outdoor walking interventions analyzed their impact on outdoor walking activity after the intervention.

Fidelity

Fidelity of treatments is the extent to which interventions are implemented as intended (Moncher & Prinz, 1991). To better define and understand this concept, treatment fidelity can be divided into five domains: treatment delivery, training of treatment providers, study design, treatment receipt, and enactment (Borrelli, 2011). Fidelity of treatment delivery is the assessment of whether treatment providers deliver the intervention as intended (according to the protocol) to ensure that all the prescribed components of the intervention are delivered (Borrelli, 2011). Evaluating fidelity of provider training includes delivery of the same training to all treatment providers, development of standardized materials for training, and monitoring providers skills to make sure they are maintained throughout the intervention (Borrelli, 2011). Maintaining fidelity of study design is important to ensure that the hypotheses of the study are tested and that the aspects of the intervention that are hypothesized to positively affect the outcome variable are conducted as planned (Bellg et al., 2004). In addition, it ensures that the protocol is faithful to the theory that informed the study (Borrelli, 2011). Fidelity of treatment receipt involves determining participants' understandings of the activities performed in the intervention and beliefs about whether they will be able to apply the skills learned during treatment in their everyday routines (Borrelli, 2011). Finally, enactment refers to whether participants actually implement the skills learned during treatment in their daily life (Bellg et al., 2004).

Assessing treatment fidelity is important because it determines the internal validity of the results (Borrelli et al., 2005). In other words, it determines the extent to which the results post-intervention could be a consequence of the protocol (Borrelli et al., 2005). Determining internal validity of studies is important to avoid the dissemination of interventions that are mistakenly thought to be effective and interventions that are thought to be ineffective but are in fact effective (Vermilyea, Barlow, & O'Brien, 1984). In addition, fidelity evaluation enables researchers to determine the external validity of the results, which provides information about the extent to which the results achieved with an intervention can be generalized to other sites (Borrelli et al., 2005). In multi-centre studies, a fidelity evaluation is important to determine whether the treatment was delivered similarly across sites, and if not, it enables researchers to identify drifts from the protocol (Paulson et al., 2002).

Evidence shows that interventions delivered with a high degree of fidelity may be more effective than interventions that do not strictly follow the protocol (Raedeke & Dlugonski, 2017; Rovniak et al., 2005). Raedeke and Dlugonski (2017) conducted a randomized controlled trial to compare step counts between participants (mean age 44.5 years) who received interventions with theoretically high and low levels of fidelity (based on social-cognitive theory). The main focus of social-cognitive theory treatments is to improve self-efficacy by discussing theory-based recommendations (Raedeke & Dlugonski, 2017). All participants attended a 30 minute-walking session once per week. The treatment was determined to be high-fidelity for the groups that also met once a week for 30 minutes to discuss goal setting and strategies to overcome barriers to PA, and to share both success stories around PA and the number of steps taken in the previous week (social-cognitive theory). The goal of these group meetings was to increase self-efficacy for performing PA. Participants in the low-fidelity treatment did not receive any theory-based recommendations. The authors observed that participants who received the high-fidelity treatment significantly increased the number of steps per day compared to the group that received the low-fidelity treatment. In addition, among participants who received the high-fidelity treatment, those who attended at least 80% of the walking sessions improved steps per day even more compared to individuals who attended less than 80% of the sessions.

Although high-fidelity treatments have been shown to be more effective and fidelity evaluations have been demonstrated to be necessary, most randomized controlled trials do not determine fidelity of interventions (Lambert et al., 2017; Moncher & Prinz, 1991). One of the biggest problems that arises from this lack of attention to fidelity is the dissemination of treatments that are thought to be effective but may not be (type I error) (Borrelli, 2011). Some of the reasons that researchers may not evaluate fidelity may include: lack of knowledge, lack of theories and guidelines about fidelity, no requirements for details of fidelity evaluation from scientific journals, and lack of time and money (Perepletchikova, Hilt, Chereji, & Kazdin, 2009).

When fidelity is assessed in randomized controlled trials, this is usually accomplished through site observation, interviews with individuals who delivered the intervention and/or with participants who received the intervention, review of videotaped sessions, and analysis of project documentation and participant records (Mowbray, Holter, Teague, & Bybee, 2003). One of the issues in using interviews to evaluate treatment fidelity is that it may be difficult to determine the validity of this type of measurement (Mowbray et al., 2003). Individuals who deliver the intervention may feel pressured due to social desirability to confirm that the protocol was followed (Mowbray et al., 2003). In addition, many factors such as the participants' worldview (Scheirer, 1978) and differences between participant and staff priorities (Kaufmann, Sorensen, & Raeburn, 1979) may influence participants' satisfaction with the intervention and the staff. Analysis of project documentation and participant records could also impose validity issues since individuals who analyze the documents are not blinded to intervention status (Mowbray et al., 2003). Thus, when evaluating fidelity of treatments, measurement tools must be carefully considered since they can impact validity and reliability of the results.

Only a few randomized controlled trials that involved walking sessions have evaluated fidelity of the treatments to date (Resnick et al., 2011; Tappen, Roach, Applegate, & Stowell, 2000). Tappen et al. (2000) evaluated treatment fidelity of three interventions aiming to improve functional mobility in older adults with Alzheimer's disease who lived in a nursing home. One intervention consisted of a 30 minute indoor walk; the second intervention combined a 30 minute walk with conversation simultaneously; and the third treatment consisted of a 30 minute conversation session. The authors observed that participants in both the walking only group and the conversation only group demonstrated an 18.8-20.9% decline in functional mobility over a 16-week period, which was measured by a modified version of the 6-Minute Walk, in which participants were allowed to ask for the help of the examiner. On the other hand, participants in the combined walk and conversation group demonstrated only a 2.5% reduction in functional mobility. It was specified in the protocol that all participants would receive 48 sessions over 16 weeks (follow-up testing occurred right after the intervention ended). However, participants in the walking group attended only 57% of the sessions; participants in the conversation group attended 90% of the sessions; and participants in the combined walk and conversation group attended 75% of the sessions. This information is important because there were significant differences in attendance between the three groups ($p = 0.0001$). Therefore, the authors could not conclude that the walking group was less effective than the conversation group because participants attended fewer walking sessions than were planned for the intervention.

Resnick et al. (2011) evaluated fidelity of a randomized controlled trial that aimed to improve motor learning and aerobic fitness in patients with chronic stroke through treadmill training. The protocol specified that initially participants in the exercise group would walk on the treadmill for 10–20 minutes at 40–50% of maximal heart rate reserve three times per week. Every two weeks (over the 6 month intervention), the intensity and duration of walking increased according to participants' tolerance. The goal was to achieve 35 minutes walking on the treadmill at 60–70% maximal heart rate reserve. The walking sessions also included 5 minutes of warm-up and 5 minutes of cool down on the treadmill at a lower speed. Participants in the control group performed stretching exercises three times per week for six months for 45 minutes. The authors observed that participants from both groups attended the expected number of sessions that were specified in the protocol (participants in the exercise groups attended on average 72.8 sessions; participants in the control group attended on average 65.4 sessions). Participants in the walking group exercised for 23 minutes in each session in the first three months and for 29 minutes in the last three months. Approximately 48% of the sample were able to meet the protocol and progress to walk at 60-70% of their maximum heart rate. In addition to this evaluation, researchers also used a checklist to qualitatively evaluate both interventions, which identified some deviations from the protocol. The protocol stated that the interventionist would work with participants individually, whereas in practice he worked with participants as a group; the number of repetitions of each stretching exercise was not always performed as per protocol; and in some walking sessions, participants did not wear the polar heart rate monitor. Therefore, it is possible to conclude that the results achieved post-intervention were not a consequence of all aspects stated in the protocol since participants in both groups did not always exercise at the target intensity or complete the specified number of repetitions established for the sessions.

These few studies that have assessed fidelity of walking sessions in older adults demonstrated how complicated it can be to meet all aspects of the protocol. However, it is still necessary to evaluate treatment fidelity of walking sessions to provide information about the activities that were performed. In addition, researchers should consider factors that could improve fidelity of treatments. When there is more than one person delivering the intervention, individuals should use standardized materials, as well as practice together beforehand so that variation among the instructors' delivery is minimized (Bellg et al., 2004; Borrelli, 2011). Principal investigators should be involved in these training sessions to observe and provide feedback on whether the delivery is, in fact, similar among instructors (Bellg et al., 2004; Borrelli, 2011). Ideally, researchers should also observe some sessions of the intervention to ensure all aspects of the protocol are being implemented properly (Bellg et al., 2004; Borrelli, 2011).

In conclusion, being able to perform PA outdoors has many important health benefits (Kerr, Sallis, et al., 2012; Simonsick et al., 2005; Thompson Coon et al., 2011), but many environmental (Etman et al., 2016; King et al., 2011) and individual (Auais et al., 2017; Merja Rantakokko et al., 2009; Simonsick et al., 2005) barriers may limit outdoor mobility in older adults. Evidence shows that most older adults do not leave the home and perform PA outdoors regularly (Simonsick et al., 2005; A. R. Smith et al., 2016). In addition, most Canadian adults do not meet recommended levels of PA (Colley et al., 2011). When randomized controlled trials are conducted, it is important to evaluate the fidelity of interventions to determine whether the results achieved can be attributed to all the aspects specified in the protocol (Hohmann & Shear, 2002). When fidelity of effective interventions is shown to be high, researchers can be more confident in disseminating treatment protocols for broader use.

Purpose, Objectives and Hypothesis

Purpose

The purpose of this study was to analyze fidelity of treatment delivery, provider training, and study design of the first year of the Getting Older adults OUTdoors (GO-OUT) study's supervised outdoor walking sessions. Data collection took place in Winnipeg, Toronto, Edmonton, and Montreal during the spring/summer of 2018.

Objectives

1. a) Fidelity of Treatment Delivery: To compare mean distance walked and walking duration in weeks 3 and 9 (activity monitor and GPS data), attendance rates and use of Nordic poles (data from the process indicators forms), and the number of components performed in each session (e.g. warm-up, first walk, etc. recorded on the implementation fidelity forms) to the goals pre-established for the walking sessions.

   b) Fidelity of Provider Training: To observe the training of the walking leaders (conducted by telephone) and analyze study documentation (agenda for the training and reflective notes) in terms of training of the walking leaders.

   c) Fidelity of Treatment Design: To analyze the results from the pilot study conducted in 2015, evaluate the safety guidelines for the walking sessions, and examine the study protocol and compare it to the theoretical framework that informed the development of the study (Patla & Shumway-Cook, 1999).

2. To describe **secondary** gait and physical activity parameters (distance walked, gait speed, total steps, mean cadence, peak cadence, minutes of light PA and MVPA, sporadic minutes of active time, and duration of the longest resting bout) achieved by more advanced and less advanced walkers during the supervised walks (weeks 3 and 9).

Hypotheses

1. Fidelity of treatment delivery: Older adults in the walking group will achieve the primary objectives as outlined in the study protocol for each supervised walking session (e.g., distances walked, completion of activities in the specified time, use of Nordic poles).
2. Fidelity of provider training: The same training session will be delivered to all walking leaders, the agenda for the training session will be followed and all the topics will be addressed, and the walking leaders will deliver the training and solve problems the same way.
3. Fidelity of study design: The study protocol will test the hypotheses of the GO-OUT study and will be sufficiently specific in terms of the activities that should be performed and their dose, and standardized materials will be provided to walking leaders and assistants to ensure the walking sessions are conducted as designed by the researchers.

The Getting Older adults OUTdoors (GO-OUT) study

The GO-OUT study, a 2 year multi-centre randomized controlled trial, is taking place in Winnipeg, Edmonton, Toronto, and Montreal (Salbach et al., 2019). A pilot study was conducted previously to determine feasibility of the project (Barclay et al., 2018). Data from the walking sessions in the first year of the GO-OUT randomized controlled trial are presented in this Master's thesis; the second year of the study is still ongoing. The purpose of the GO-OUT study is to compare the effectiveness of a 10-week outdoor community mobility intervention plus a one-day educational workshop to the effectiveness of weekly calls with tips on how to improve outdoor walking plus a one-day educational workshop in older adults (≥65 years) with an outdoor community mobility limitation (Salbach et al., 2019). At baseline, age, sex, marital status, employment status, education/income level, medication use/change, car access, and walking ability (if participant uses walking aid, frequency and duration of outdoor walking, reasons for outdoor walking limitation) are collected. Baseline testing includes measurement of height and weight, heart rate, blood pressure, comorbidity (Charlson Comorbidity Index) (Charlson, Pompei, Ales, & MacKenzie, 1987; Quan et al., 2011), frailty (Cardiovascular Health Study Frailty Index) (Fried et al., 2001), ambulation self-efficacy (Ambulatory Self-confidence Questionnaire (ASCQ)) (Asano, Miller, & Eng, 2007), quality of life (Patient Generated Index (PGI)) (Martin, Camfield, Rodham, Kliempt, & Ruta, 2007; Ruta, Garratt, Leng, Russell, & MacDonald, 1994), health related quality of life (RAND-36) (Hays & Morales, 2001), participation and PA (Community Health Activities Model Program for Seniors) (Giles & Marshall, 2009), life-space mobility (Life-Space Assessment (LSA)) (Baker et al., 2003), endurance (6-min walk test (6 MWT)) (Holland et al., 2014), balance **(**Mini Bestest**)** (Horak, Wrisley, & Frank, 2009), leg strength (30-Second Sit-to-Stand test) (Macfarlane, Chou, Cheng,

& Chi, 2006; Rikli & Jones, 1999), walking speed (10-metre Walk Test (10 mWT) at a comfortable pace and a fast pace) (Perera, Mody, Woodman, & Studenski, 2006), outdoor walking activity (activity monitors and GPS devices), and neighbourhood walkability (Neighbourhood Environment Walkability Scale) (Cerin, Saelens, Sallis, & Frank, 2006; Saelens, Sallis, Black, & Chen, 2003). The study is registered with ClinicalTrials.gov (NCT03292510).

All participants in the study attend a one-day interactive and educational workshop, which is divided into 8 stations that provide information about the PA recommendations from the Canadian Physical Activity Guidelines for older adults, as well as foot care hygiene, appropriate shoes for walking outdoors, proper walking patterns, how to set SMART goals, use of pedometers and falls prevention. In addition, participants are taught some postural awareness and balance exercises, Nordic pole walking and how to monitor exercise intensity and safety. After the workshop, participants are randomized to workshop plus weekly reminders or workshop plus walking group (GO-OUT intervention). Individuals in the workshop plus weekly reminders group receive weekly telephone reminders that last for about 15 minutes with tips on outdoor walking and a review of material learned in the workshop. Participants in the GO-OUT intervention are divided into 2 groups based on their comfortable walking speed (10 mWT): the less advanced (gait speed <0.8 m/s) and the more advanced (gait speed ≥ 0.8 m/s) walkers. They attend bi-weekly supervised outdoor walking sessions for 10 weeks. The walking sessions happen in parks, which were carefully chosen so that elevation would be similar among all research sites. The protocol for the walking group (Salbach et al., 2019) specifies that sessions last for 1 hour each with 10 minutes (min) of warm up, 10 min of continuous walking on a paved path, 20 min of specific activities focusing on decreasing barriers to outdoor walking (short walking drills), another 10 min of continuous walking, and 10 min of cool down. The warm-up, the short walking drills and the cool down are performed by the whole group together. The long walks are performed separately by the less advanced and the more advanced walkers as the distances they walk are different. Walking leaders and assistants walk together with participants in all components of the session to ensure their safety. During the walking sessions, walking leaders also review some topics from the workshop. In addition, participants participate in walking activities that involve increasing distances and walking speeds within safe limits for the participants and perform activities that involve the dimensions of mobility discussed in Patla and Shumway-Cook's framework (Patla & Shumway-Cook, 1999).

The GO-OUT intervention was designed to decrease barriers to outdoor walking by helping participants adapt to environmental characteristics (e.g. high curbs, stairs, ramps, traffic levels) to potentially increase physical function and self-efficacy and ultimately, increase outdoor mobility. If participants learn how to adapt to the environment, self-efficacy for walking outdoors may increase and fear of falling and moving outdoors may decrease. If environmental and individual barriers can be minimized, participants may walk more outdoors.

Methods

Ethics

The Getting Older adults OUTdoors (GO-OUT) study was approved by the Health Research Ethics Board from the University of Manitoba, and from the respective ethics boards at the University of Alberta, University of Toronto, and McGill University.

Design

This study was a sub-section embedded in the larger GO-OUT trial. This sub-study measured fidelity of the walking sessions included in the GO-OUT intervention.

Recruitment

Participants were recruited for the GO-OUT study by local community newspaper advertisements in the seniors' sections, public service radio announcements, snowball sampling (i.e., participants refer a friend), and posters in seniors' residences and fitness centres. Community partners who specifically engage seniors advertised using electronic newsletters, posters and brochures. In this study, only participants in the walking group will be analyzed. In 2018, 33 participants (7 in Winnipeg, 9 in Toronto, 11 in Edmonton, and 6 in Montreal) were randomized to the walking group.

Inclusion Criteria

The GO-OUT protocol (Salbach et al., 2019) lists the following inclusion criteria for participants: older adults (age ≥65 years); ability to walk at least 1 block (~50 metres) continuously on a flat surface without supervision, with or without walking aids (self-reported); difficulty walking in the outdoor community environment (self-reported); limited PA outdoors (less than 75 minutes per week) from May to October (self-reported); safe to exercise (completion of the Get Active Questionnaire and confirmed by physician or sign a waiver (site dependent)); and mental competency (i.e., score of ≥18/22 on the Mini-mental State Exam-telephone version).

Exclusion Criteria

Individuals who walk at least 150 min/week indoors or outdoors, who are receiving therapy to improve mobility and who are at high falls risk as per American Geriatric Society criteria (2 falls in the last 12 months, postural hypotension, severely limited visual acuity or abnormal resting heart rate) are not eligible to participate in the study.

Measurement Tools

In this study, we analyzed fidelity of treatment delivery, provider training, and study design. Fidelity of treatment receipt and enactment were not evaluated because it was not feasible to conduct additional interviews with participants due to lack of time and money. Furthermore, we did not want to require participants to fill out more questionnaires as this would increase burden on participants and could lead to more withdrawals from the study.

Fidelity of treatment delivery. ActiGraph activity monitors (GT3X+, ActiGraph, Inc., Pensacola, FL) were used to measure cadence, minutes of light activity and MVPA, total steps, and duration of continuous bouts of activity. The monitors were initialized using the ActiLife 6 software (version 6.13.3) and set to collect data at a sample rate of 100 Hz. Global Positioning System (GPS) devices (QStarz BT-Q1000XT A-GPS Travel Recorder) were used to measure gait speed and distance walked. Participants wore both devices positioned on the right hip during 2 supervised outdoor walking sessions (week 3 session #1 and week 9 session #1) of the GO-OUT intervention. Activity monitors have been shown to have good validity (Rabinovich et al., 2013; Wetten, Batterham, Tan, & Tapsell, 2014) and reliability (Aadland & Ylvisåker, 2015) to measure PA in older adults. However, to date, no studies have been conducted to determine validity and reliability of the QStarz BT- Q1000XT A-GPS Travel Recorder. Thus, to determine accuracy of this device in measuring location (latitude and longitude coordinates), we conducted a pilot test in a park in Winnipeg. Two GPS devices were worn during walking activities and a measuring wheel was used to measure distance walked by a research assistant. Results showed that the GPS devices were accurate within 1-4% for walking distance using the Haversine formula to calculate distance based on latitude and longitude data points recorded by the GPS devices: (6371 * acos (cos (radians (90-first latitude)) * cos (radians (90-second latitude)) + sin (radians (90-first latitude)) * sin (radians (90-second latitude)) * cos (radians (first longitude-second longitude))) (Bluemm, 2007) (Table 1). The absolute percent error was calculated by taking the difference between the distance measured by the measuring wheel and the distance determined from the formula and then multiplying the result by 100 and dividing by the distance measured from the measuring wheel.

Table 1

Results from the Pilot Testing to Determine Accuracy of the QStarz BT- Q1000XT A-GPS Travel Recorder

	Start time/stop time	Distance measured with measuring wheel	Distance calculated with the formula	Absolute Percent Error
Activity 1: walk 300 metres in a straight line.	10:19/10:26	344 metres	GPS 1: 348 metres GPS 2: 359 metres	GPS 1: 1.2% GPS 2: 4.4%
Activity 2: walk 300 metres following a zig zag path.	10:28/10:34	312 metres	GPS 1: 315 metres GPS 2: 310 metres	GPS 1: 1.0% GPS 2: 0.6%

Activity 3: walk 30 metres at a faster gait speed and stop. Repeat the activity another 3 times. Then, walk 200 metres at a normal gait speed and stop suddenly a few times along the way.	10:37/10:44	317 metres	GPS 1: 322 metres GPS 2: 323 metres	GPS 1: 1.6% GPS 2: 1.9%

Note. GPS = Global Positioning System.

In addition to using activity monitors and GPS devices in two walking sessions, two forms (process indicators and implementation fidelity) were completed by the walking leaders after each walking session (20 sessions in total). The process indicators form specified whether each participant attended the session and whether he or she used Nordic poles during the session. The implementation fidelity form provided information on the activities the group performed during the session. All these documents were analyzed and compared to the protocol set for each session.

Fidelity of provider training. To determine fidelity of provider training, the training session conducted by telephone with all walking leaders was observed and compared to the agenda set for that meeting. Information from the observation of walking sessions in Toronto (2018) and Winnipeg (pilot study, 2015) was provided by the principal investigators. The walking leaders wrote down reflective notes at the end of each walking session (20 sessions in total). These notes specified anything the leaders judged important, especially how they dealt with challenges during the sessions, which helped explain some drifts from the protocol.

Fidelity of study design. The study protocol was analyzed in terms of its specificity (dose of activities and activities that should be performed) and compared to the theoretical framework that informed the development of the study. In addition, other project documentation (safety guidelines for the walking leaders and results from the pilot study conducted in 2015) were examined.

Data Collection

Data collection using the GPS devices and the activity monitors occurred during two supervised outdoor walking sessions of the GO-OUT study (week 3 session s#1 and week 9 session #1). When any participant did not attend the first walking session of any of these weeks, data from these participants were collected in the second walking session of the same week. Data collection using the implementation fidelity forms, process indicator forms, and the reflective notes happened in all sessions. Walking leaders noted any time they needed to cancel a session. Criteria to cancel a walking session included: rain, thunder/lightning, humidex above 30, temperature above 30 degrees Celsius or below 5 degrees Celsius, wind speed above 30 km/h, Air Quality Health Index Values at high risk levels, and an insufficient ratio of instructors-to-participants, i.e., less than 1 instructor to 3 participants (e.g., due to instructor illness).

According to the pre-set walking session protocol, all 20 walking sessions had the same general structure: 10 minutes of warm up, 10 minutes of walking on a paved path (distance increased from one week to the next), 20 minutes of short walking drills that included some of the dimensions of mobility proposed in the framework developed by Patla and Shumway-Cook (1999), another 10 minutes of continuous walking on the paved path, and 10 minutes of cool down. While the warm up and the cool down were composed of the same exercises for all walking sessions, the distance established for the first and the second long walks, as well as the short walking drills, varied from one week to the next.

In week 3, the protocol specified that less advanced walkers (gait speed < 0.8 m/s) would walk 225 metres (m), while more advanced walkers (gait speed ≥ 0.8 m/s) would walk 425 m in both the first and the second longer walks in the session. Usual gait speed of participants was measured at baseline in the 10 mWT and this was used to categorize participants into the more/less advanced walking groups. The short walking drills involved dealing with temporal factors (walking at a gait speed of 1 m/s and if appropriate, progressing to 1.25 m/s) and postural transitions (walking with a sudden stop). In week 9, the protocol specified that less advanced walkers (gait speed < 0.8 m/s) would walk 400 m, while more advanced walkers (gait speed $\geq$ 0.8 m/s) would walk 600 m in both the first and the second walks in the session. The short walking drills again involved dealing with temporal factors (walking at a gait speed of 1 m/s and if appropriate, progressing to 1.25 m/s) and traffic density combined with temporal factors (walking at a gait speed of 1 m/s and if appropriate, progressing to 1.25 m/s while walking through a crowd).

During these two walking sessions, participants wore a GPS device and an activity monitor attached to an elastic strap positioned on the right hip. Documents that explained how to set the activity monitors and GPS devices for data collection and how to download the data were developed to ensure that data collection was consistent across sites. Using the ActiLife 6 software, activity monitors were set to collect data at a sampling rate of 100 Hz, to start collecting data 1 hour before the walking session and to stop collecting data 1 hour after the end of the walking session. Using the QTravel software, GPS devices were set to collect data every 1 second (s). In the beginning of the walking sessions, participants received both devices, and the start of “wear time” was recorded by the walking leaders. At the end of the session, walking leaders collected the devices and returned them to site coordinators to download the data for analysis. In addition, at the end of all 20 walking sessions, walking leaders wrote down reflective notes including any facts about the session they judged relevant, filled out the process indicators form for each participant, and filled out the implementation fidelity form for the whole group.

Data Analysis

Fidelity of the supervised walking sessions (week 3 session #1 and week 9 session #1) in terms of treatment delivery was analyzed by comparing mean walking distance of the first and the second long walks and mean duration of each component of the session to the pre-specified outcomes in the protocol. Activity monitor data were analyzed using ActiLife 6 software (version 6.13.3). Data were downloaded to create a 1 s epoch AGD LFE (low frequency extension) file. We originally analyzed the data using both the LFE file and the Default file. Dividing the total steps of the first and the second long walks by the distances covered in these walks, a median step length of 54 centimetres (cm) (IQR 11 cm) was observed with the LFE analysis compared to 85 cm (IQR 38 cm) with the Default analysis. Since step lengths usually range from 52-57 cm in older women and from 57-66 cm in older men (Hollman, McDade, & Petersen, 2011; Shimada et al., 2010), the LFE analysis appeared to be more appropriate for this study considering the target population. In addition, even though LFE files tend to overestimate number of steps when individuals wear the monitors for 7 consecutive days (Feito, Hornbuckle, Reid, & Crouter, 2017), this filter appears to be relatively accurate when activity monitors are worn for short periods of time while individuals are walking (Webber & St John, 2016). GPS data were processed using QTravel (QStarz, Taipei, Taiwan); data were downloaded to create a raw data excel spreadsheet file as well as a KML file for Google Earth (Google Inc., California). In ActiLife, the 1 s epoch AGD LFE file was reintegrated to 5 s and 60 s epoch AGD LFE files. Activity monitor data (5 s and 60 s epoch AGD LFE files) were then time synchronized with GPS data (raw data file) to form CSV files that consisted of the following columns: date, axis 1, 2 and 3, steps, latitude, and longitude.

Using the synchronized, combined GPS and activity monitor files, walking sessions were first analyzed as a whole. Distance walked was calculated using latitude and longitude coordinates from the synchronized 5 s epoch files. Total steps, sporadic active time (sum time of 5 s epochs with at least two steps), and the longest resting bout (sum time of consecutive 5 s epochs with less than 2 steps) were determined. The 60 s epoch files were used to detect minutes spent in different cadence bands (e.g., 1 to 19 steps/min, 20 to 39 steps/min, etc.), minutes of light PA, and MVPA during the entire walking session. Light PA, defined as activities performed between 1.5 and 3 metabolic equivalents (METs) (e.g., slow walking and light household work), was characterized using Lifestyle (100 - 759 counts per minute (cpm)) (Matthew, 2005) and Freedson (100 - 1951 cpm) (Freedson, Melanson, & Sirard, 1998) cut-points. Moderate-to-vigorous PA, activities performed at an intensity of 3 METs or more (e.g. brisk walking), was also characterized using Lifestyle (760 - 5724 cpm) and Freedson (moderate: 1952 - 5724 cpm; vigorous: 5725 – 9498 cpm) cut-points. These cut-points use cpm based on the vertical acceleration signal.

After analyzing the walking session as a whole, the first and the second long walks were examined. Distance walked was calculated using latitude and longitude coordinates from the synchronized 5 s epoch files. Duration and total steps were measured from the synchronized 5 s epoch file, while mean cadence (steps/min) and peak cadence (minute with the highest cadence during each long walk) were determined from the synchronized 60 s epoch file. Gait speed was calculated using duration of the long walk and distance walked (speed = distance/time). Walks were identified by looking at the number of steps recorded every 5 s; in the long walks, steps were continuous and usually >1 per 5 s epoch. If participants needed to rest in the middle of the walk, the resting time was counted as part of the walk. After analyzing the entire walking session and both the first walk and the second walk, the short walking drills were examined.

Data from the short walking drills were also identified looking at the steps column. In this component of the session, steps varied considerably since participants performed short activities and then rested between them. From the synchronized 5 s epoch file, distance, duration, total number of steps, and best 10 s cadence were reported. Lastly, duration of the warm-up and the cool down were measured from the synchronized 5 s epoch file. The warm-up and cool down components were identified by looking at the steps column; steps were not continuous, and many epochs showed no steps.

Fidelity of the walking sessions (20 sessions in total) in terms of treatment delivery was also determined by analyses of the implementation fidelity form and process indicators form. The implementation fidelity form provided quantitative data about the number of components (e.g., warm-up, first walk) that were performed in each walking session. The process indicators form also provided quantitative data and gave information about attendance rates and use of Nordic poles. Determining fidelity of provider training involved the observation of the training session (conducted by telephone) and comparison of the aspects addressed during the training to the main points included in the agenda set for that meeting. It also involved the analysis of aspects related to the walking sessions (documents, observation of walking sessions) and the evaluation of the reflective notes, which provided qualitative data about the important facts that happened during the sessions. In this qualitative component, since not all the facts were relevant to this study based on the objectives, the reflective notes were carefully analyzed and only the facts that truly impacted the fidelity of the walking sessions were reported, such as how walking leaders dealt with certain challenges during the sessions. Finally, fidelity of study design was determined based on the analysis of the study protocol in terms of its specificity (e.g., dose of activities and components of the session) and faithfulness to the theoretical framework that informed the development of the study. Safety guidelines developed by the principal investigators were also analyzed as they provided recommendations for walking leaders and assistants in terms of participants' safety during the walking sessions. Furthermore, the results from the pilot study in 2015 provided information on the feasibility of the study protocol. A summary of all of the variables related to fidelity evaluation reported in this study can be found in Table 2.

Table 2

Summary of the Variables Related to Fidelity Evaluation that Will Be Reported in the Study

	Warm-up	First long walk	Short walking drills	Second long walk	Cool down	Entire session
Mean distance walked (m)		X	X	X		X
Mean gait speed (m/s)		X		X		

Duration (min)	X	X	X	X	X	
Total steps		X	X	X		X
Mean cadence (steps/min)		X		X		
Peak cadence (steps/min)		X		X		
Best 10 s cadence			X			
Minutes spent in different cadence bands						X
Minutes of light PA and MVPA (Lifestyle and Freedson cut-points)						X
Sporadic active time (min)						X
Duration of the longest resting bout (s)						X

Fidelity of treatment delivery: Components performed (implementation fidelity forms)	X	X	X	X	X	
Fidelity of treatment delivery: Attendance (process indicators forms)						X
Fidelity of treatment delivery: Use of Nordic poles (process indicators forms)		X		X		

Note. m = metres; m/s = metres per second; min = minutes; s = seconds.

Statistical Analysis

Features of the sample were described with descriptive statistics using Sigmaplot (1735 Technology Drive, Ste 430. San Jose, CA, version 11.0). Age, sex (% female), usual gait speed (including % with gait speed higher or equal to 0.8 m/s), 6-minute walk test distances, life-space mobility scores (LSA scores), and Ambulatory Self-Confidence scores from the GO-OUT baseline measurements were reported using mean/SD or median/IQR. Normality was checked using the Shapiro-Wilk test. Mean distance walked, mean gait speed, total steps, mean cadence, peak cadence, minutes spent in different cadence bands, minutes of light PA and MVPA (Lifestyle and Freedson cut-points), sporadic active time, the longest resting bout, number of sessions attended per person, attendance per session (%), use of Nordic poles (%), number of components performed per session, frequency that each component was performed (%), and frequency of participants who achieved the goals pre-established for the walking sessions (%) were described using descriptive statistics (median/IQR). Paired t-tests or Wilcoxon Signed Rank Tests were conducted to compare distance walked and gait speed in the first and the second long walks between week 3 and week 9 for participants who attended both sessions. Independent samples t-test to compare the differences between more advanced and less advanced walkers were not conducted because of the small sample size.

Equivalence tests (Lakens, 2017; Shieh, 2016) were used to determine whether participants met the primary criteria set *a priori* for the walking sessions. In other words, we wanted to compare distance walked and walking duration achieved in the walking sessions in weeks 3 and 9 to the protocol set for those two sessions to analyze whether these two variables could be considered equivalent to the protocol. To do this, we followed the Two One-Sided Test (TOST) procedure, in which two null hypotheses have to be set: one for the lower boundary and one for the upper boundary (Schuirmann, 1987). We set the upper and the lower boundaries (e.g., 300-400 m or 8-12 min) and whenever the mean distance walked or walking duration fell within the boundaries, they were considered to be equivalent to the protocol. The boundaries were set based on values for duration/distance specified in the protocol (e.g., 50 m below and above the specified distance). The null hypothesis for the lower boundary was that the value actually achieved for duration or distance walked in the walking session would be equal to or lower than the lower boundary. On the other hand, the null hypothesis for the upper boundary was that the difference between the number specified in the protocol and the number achieved in the walking sessions would be equal to or higher than the upper boundary. Therefore, if both t-tests were statistically significant, the two null hypotheses could be rejected, which would indicate that the number achieved in the walking sessions was equivalent to the protocol.

To test for equivalency, duration in minutes (warm-up, first and second walks, short walking drills, and cool down) and distance in metres (first and second walks) achieved during the outdoor walking sessions (first sessions of weeks 3 and 9) were identified and compared to the protocol. Mean distances walked in the first and the second walks in each session were compared to the distances specified in the protocol using two different equivalence boundaries. One test was performed using a 30 metre difference between the mean distance walked and the distance specified in the protocol (i.e., if the distance achieved was >30 m longer or >30 m shorter than what was specified in the protocol then this was considered to be not equivalent). The other threshold used a 50 metre difference between the mean distance walked and the distance specified in the protocol (i.e., if the distance achieved was >50 m longer or >50 m shorter than what was specified in the protocol then this was considered to be not equivalent). These thresholds were chosen based on literature that describes a change of 14-80 metres as the minimal clinically important difference in the six-minute walk (Bohannon & Crouch, 2016; Gremeaux et al., 2011; Kwok, Pua, Mamun, & Wong, 2013; Nathan et al., 2015; Rasekaba, Lee, Naughton, Williams, & Holland, 2009; Shoemaker, Curtis, Vangsnes, & Dickinson, 2012, 2013; Wise & Brown, 2005). The distances (30 and 50 metres) were selected based on what is more consistent with the literature; most of the studies found the minimal clinically important difference to be from 25-50 metres (Bohannon & Crouch, 2016; Gremeaux et al., 2011; Nathan et al., 2015; Rasekaba et al., 2009; Shoemaker et al., 2012, 2013).

To analyze equivalence related to the duration of the warm-up, the first and the second long walks, and the cool down, a 2 minute difference between the mean duration of each component of the session and the duration specified in the protocol was used (i.e., if the duration of each component was >2 minutes different from what was specified in the protocol then this was considered to be not equivalent). Since there are no indications in existing literature about what constitutes a minimal clinically important difference in the duration of outdoor activities, a 2 minute difference was chosen because it represents 20% of the total time for this component. To analyze the duration of the short walking drills, a 4 minute difference (20% of total time for this component) was used. In terms of total duration of the session, a 6 minute difference (10% of the total duration) was used. We also tested this with a 12 minute difference (20% of the total duration) between the actual duration of the session and the duration specified in the protocol and found that all participants' activity durations fell within the equivalence boundaries and thus, the drifts from the protocol that occurred in the 5 components of the session were not detected using this large threshold.

The equivalence testing for one sample was performed using an Excel spreadsheet (Lakens, 2016). To run the equivalence testing, we chose to use the Cohen's d coefficient, which is an effect size used to detect differences between two means (Cohen, 1988). In our study, we wanted to analyze whether the difference between the mean distance walked or the mean walking duration and the distance or duration specified in the protocol was small enough to be considered equivalent. Thus, as mentioned before, we previously selected a difference from the protocol (metres for distance and minutes for duration) to set the lower and upper equivalence boundaries and convert them to two Cohen's d values. To find the Cohen's d value for the lower boundary, we used the following formula: - difference from the protocol / standard deviation. To calculate the Cohen's d coefficient for the upper boundary, we used the following formula: + difference from the protocol / standard deviation. Whenever the Cohen's d coefficient (achieved by participants in weeks 3 and 9) fell within the lower and upper Cohen's d boundaries, it was considered to be equivalent to the protocol. Next, we filled out the excel spreadsheet with the mean and the standard deviation (for duration and distance walked achieved in weeks 3 and 9), sample size, and the value to test against (distance and duration specified in the protocol). Then, the spreadsheet provided the Cohen's d coefficient and whether the observed effect size was statistically significant and fell within the equivalent boundaries. If the observed effect size was within the equivalent boundaries and statistically significant, the test was found to be equivalent. The power of each equivalence test was calculated using the TOSTER package on RStudio, which was also developed by Daniel Lakens. The formula used to calculate power was powerTOSTone(alpha=.05,N=x, low_eqbound_d=-x, high_eqbound_d=x). Statistical significance was set at $p < 0.05$.

Results

Characteristics of the Sample

In total, 33 participants were randomized to the walking group (7 in Winnipeg, 11 in Edmonton, 9 in Toronto, and 6 in Montreal). Because 3 participants withdrew from the study before the walking sessions started and another 2 informed the principal investigators that they would not be able to attend any of the sessions, 28 were included in this study (6 in Winnipeg, 8 in Edmonton, 8 in Toronto, and 6 in Montreal). Based on baseline data, participants were categorized as being in the less advanced walking group (gait speed <0.8 m/s) and the more advanced (gait speed ≥ 0.8m/s) walking group; 6 (21.4%) of them were included in the less advanced walking group, while 22 (78.6%) were included in the more advanced walking group. Their baseline characteristics can be found in Tables 3 and 4.

Table 3

Baseline Characteristics of the Less Advanced and the More Advanced Walking Groups per Research Site

	Winnipeg Median (IQR)		Edmonton Median (IQR)		Toronto Median (IQR)		Montreal Median (IQR)	
	LAW n=3	MAW n=3	LAW n=1	MAW n=7	LAW n=1	MAW n=7	LAW n=1	MAW n=5
Age (years)	80.0 (6.8)	73.0 (9.8)	69.0	74.0 (12.3)	77.0	82.0 (11.5)	90.0	74 (12.5)
Sex (% female)	66.7	66.7	100.0	71.4	100.0	85.7	100.0	100.0
10 mWT (m/s)	0.7 (0.1)	1.0 (0.1)	0.6	1.3 (0.3)	0.8	0.9 (0.1)	0.7	1.0 (0.6)
6 MWT (m)	250.3 (48.8)	307.8 (53.0)	300.0	428.6 (63.6)	222.6	285.7 (86.9)	260.0	280.0 (130.0)

LSA score	35.0 (9.8)	60.5 (22.5)	52.5	64.0 (29.5)	27.5	38.0 (22.4)	52.0	54.0 (24.8)
ASCQ	7.5 (1.8)	7.9 (1.0)	7.5	9.5 (0.9)	3.3	7.2 (2.1)	6.3	7.2 (3.1)
Use of mobility aid (%)	66.7	33.3	100.0	28.6	100.0	71.4	0.0	40.0

Note. LAW = Less Advanced Walkers; MAW = More Advanced Walkers; 10mWT = 10 metre Walk Test; 6 MWT = 6 Minute Walk Test; LSA score = Life Space Assessment score; ASCQ = Ambulatory Self-Confidence Questionnaire; m/s = metres per second; m = metres. Gait speed of participant in the less advanced walking group in Toronto was 0.78 m/s (to two decimal places).

Table 4

Baseline Characteristics of the Less Advanced and the More Advanced Walking Groups Across All Research Sites

	Less Advanced Walkers n=6 Median (IQR)	More Advanced Walkers n=22 Median (IQR)
Age (years)	78.5 (9.0)	74.5 (11.0)
Sex (% female)	66.7	81.8
10 mWT (m/s)	0.7 (0.2)	1.0 (0.3)
6 MWT (m)	255.2 (43.0)	318.9 (138.4)
LSA score	40.5 (19.0)	56.0 (11.0)
ASCQ	6.9 (1.5)	8.4 (2.3)
Use of mobility aid (%)	66.7	45.5

Note. LAW = Less Advanced Walkers; MAW = More Advanced Walkers; 10 mWT = 10 metre Walk Test; 6 MWT = 6 Minute Walk Test; LSA score = Life Space Assessment score; ASCQ = Ambulatory Self-Confidence Questionnaire; m/s = metres per second; m = metres.

Gait and PA parameters

Data collection happened in the first session of the week in both weeks 3 and 9 in all sites except in Toronto where data was collected in the second session of week 3 because the first session was cancelled due to rain. Table 5 shows the gait and PA parameters achieved by the more advanced and the less advanced walkers in both weeks 3 and 9. Overall, even though we did not perform t tests to compare the groups, the less advanced and the more advanced walkers demonstrated similar distances covered in the entire session, gait speeds in the first and the second long walks, and steps taken in the entire session in both weeks 3 and 9. However, mean cadence, peak cadence, and minutes of MVPA (Lifestyle and Freedson cut-points) were higher in the more advanced walking group, while minutes of light PA (Lifestyle and Freedson cut-points) and longest resting bout were higher in the less advanced walking group in both weeks 3 and 9. Comparing the variables between weeks 3 and 9, both groups showed improvements.

Table 5

Gait and PA Parameters Achieved by Less Advanced and More Advanced Walkers in Weeks 3 and 9 (Median (IQR))

	Less Advanced Walkers Median (IQR)		More Advanced Walkers Median (IQR)	
	Week 3	Week 9	Week 3	Week 9
Distance covered during the entire session (m)	1013.4 (116.1)	1274.5 (380.4)	1078.2 (251.0)	1234.1 (478.1)
Distance covered during the short walking drills (m)	147.1 (58.7)	173.1 (50.9)	141.7 (75.6)	250.7 (129.1)
Gait speed 1st walk (m/s)	0.7 (0.2)	0.6 (0.3)	0.7 (0.2)	0.7 (0.3)

	Less Advanced Walkers Median (IQR)		More Advanced Walkers Median (IQR)	
	Week 3	Week 9	Week 3	Week 9
Gait speed 2nd walk (m/s)	0.6 (0.2)	0.8 (0.1)	0.7 (0.2)	0.8 (0.2)
Total steps 1st walk	647.0 (281.0)	988.0 (522.0)	787 (177.5)	869.0 (378.5)
Total steps 2nd walk	691.0 (203.0)	812.0 (156.8)	708.0 (218.0)	815.0 (193.0)
Total steps accumulated during the short walking drills	321.5 (118.0)	323.5 (133.0)	304.5 (187.5)	474.0 (190.3)
Total steps of the entire session	1720.0 (344.0)	1901.0 (609.0)	1750.5 (214)	2003.0 (613.5)
Mean cadence of the 1st walk (steps/min)	66.6 (19.1)	67.7 (10.7)	72.8 (13.4)	76.2 (15.4)
Mean cadence of the 2nd walk (steps/min)	69.2 (13.2)	72.8 (30.0)	71.7 (12.0)	79.1 (10.1)
Peak cadence of the 1st walk (steps/min)	86.5 (22.0)	89.5 (11)	92.0 (23.5)	95.0 (18.8)

	Less Advanced Walkers Median (IQR)		More Advanced Walkers Median (IQR)	
	Week 3	Week 9	Week 3	Week 9
Peak cadence of the 2nd walk (steps/min)	89.0 (22.0)	92.0 (23.3)	95.5 (16.0)	102.0 (11.0)
Best 10 s cadence of the short walking drills	17.0 (2.0)	19.5 (5.0)	18.0 (3.0)	21.0 (2.0)
Minutes of light activity (Lifestyle 100-759 cpm) (entire session)	23.0 (7.0)	19.0 (5.0)	21.5 (7.5)	15.0 (7.0)
Minutes of light activity (Freedson 100-1951 cpm) of the entire session	39.0 (12.0)	37.0 (18.0)	37.0 (15.0)	35.0 (8.0)
Minutes of MVPA (Lifestyle 760 – 5724 cpm) of the entire session	16.5 (19.0)	21.5 (13.0)	21.0 (8.5)	24.0 (7.5)

	Less Advanced Walkers Median (IQR)		More Advanced Walkers Median (IQR)	
	Week 3	Week 9	Week 3	Week 9
Minutes of MVPA (Freedson 1952-9498 cpm) of the entire session	0.0 (1.0)	1.0 (1.0)	1.0 (6.0)	3.0 (14.8)
Sporadic active time of the entire session (min)	33.3 (4.3)	39.6 (14.0)	32.8 (6.4)	34.2 (9.8)
Longest resting bout of the entire session (min)	3.0 (1.4)	1.6 (2.7)	2.3 (1.3)	1.8 (0.8)

Note. m = metres; m/s = metres per second; s = second; min = minutes; cpm = counts per minute; MVPA = Moderate-to-Vigorous Physical Activity.

Table 6 shows a comparison of distances walked and gait speeds in the first and the second long walks in week 3 and week 9. This analysis only includes participants who performed the first and the second long walks in both weeks 3 and week 9. Overall, participants were able to follow the progressiveness of the protocol in terms of distances walked and gait speeds attained in week 3 and week 9.

Table 6

Comparisons Between Distances Walked in Week 3 and Week 9 in All Participants Completing All Walks

	All Participants		Paired t-test or Wilcoxon Signed Rank Test
	Week 3 Mean ± SD or Median (IQR)	Week 9 Mean ± SD or Median (IQR)	
Distance covered in the first walk (m)	419.0 ± 115.7 410.6 (88.1) n = 18	533.1 ± 138.8 528.5 (245.2) n = 18	t = -2.341 P = 0.032 Power = 50.8%
Distance covered in the second walk (m)	389.6 (124.0) n = 15	502.2 (141.1) n = 15	W= 116.000 T+ = 118.000 T-= -2.000 Z-Statistic (based on positive ranks) = 3.294 P = <0.001
Gait speed covered in the first walk (m/s)	0.65 ± 0.13 n = 18	0.72 ± 0.14 n = 18	t = -2.322 P = 0.033 Power = 49.9%
Gait speed covered in the second walk (m/s)	0.62 ± 0.11 n = 15	0.81 ± 0.15 n = 15	t = -3.915 P = 0.002 Power = 95.3%

Note. m = metres; m/s = metres per second; When normality test failed, the Wilcoxon Signed Rank Test was conducted instead of the paired t-test.

Figures 1 and 2 illustrate the mean number of minutes spent in different cadence bands over the entire session by the less advanced and the more advanced walkers, respectively. The more advanced walkers tended to spend more time in the higher cadence bands than the less advanced walkers in both weeks 3 and 9, but participants from both groups spent more time in higher cadence bands in week 9 compared to week 3.

Figure 1. Minutes spent in different cadence bands during the entire session in weeks 3 (n=6) and 9 (n=6) (less advanced walkers)

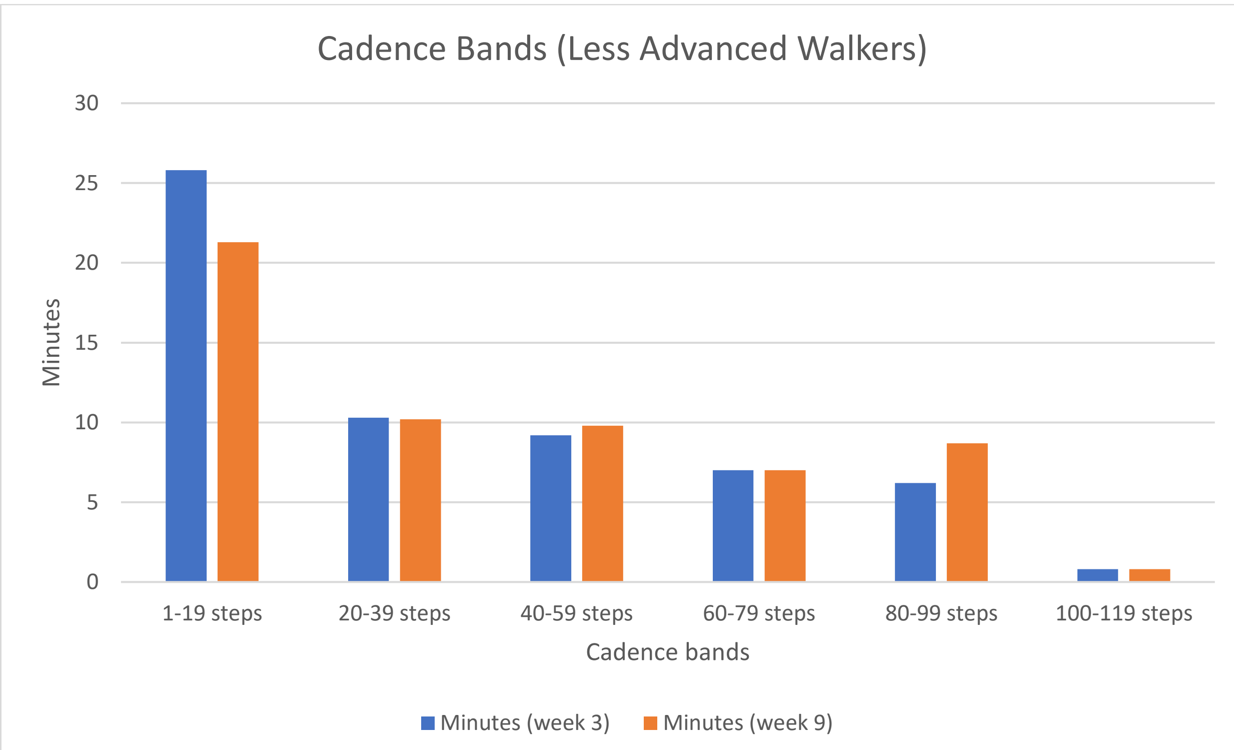
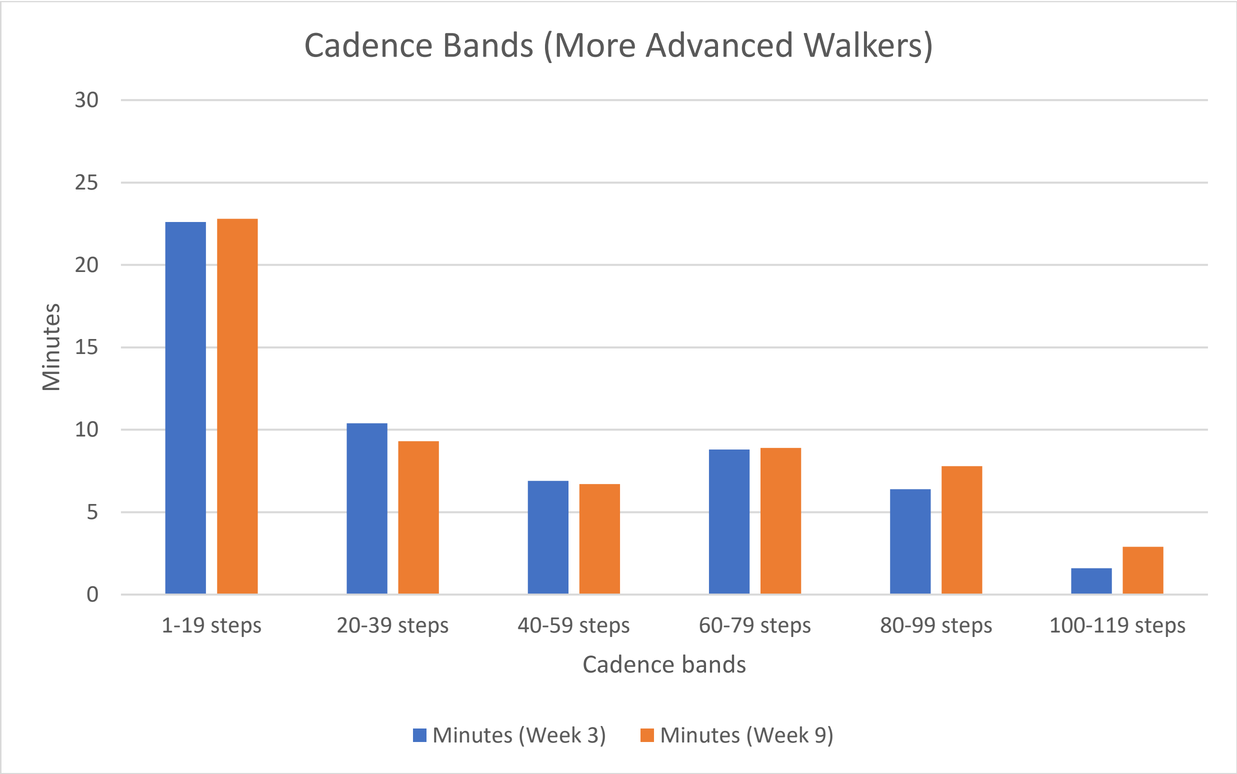


Figure 2. Minutes spent in different cadence bands during the entire session in weeks 3 (n=16) and 9 (n=15) (more advanced walkers)



Figures 3 and 4 illustrate the mean number of minutes spent in different cadence bands in the first and second long walks and the short walking drills by the less advanced and the more advanced walkers, respectively.

Figure 3. Minutes spent in different cadence bands during the first and the second long walks and the short walking drills in weeks 3 (n=6) and 9 (n=6) (less advanced walkers)

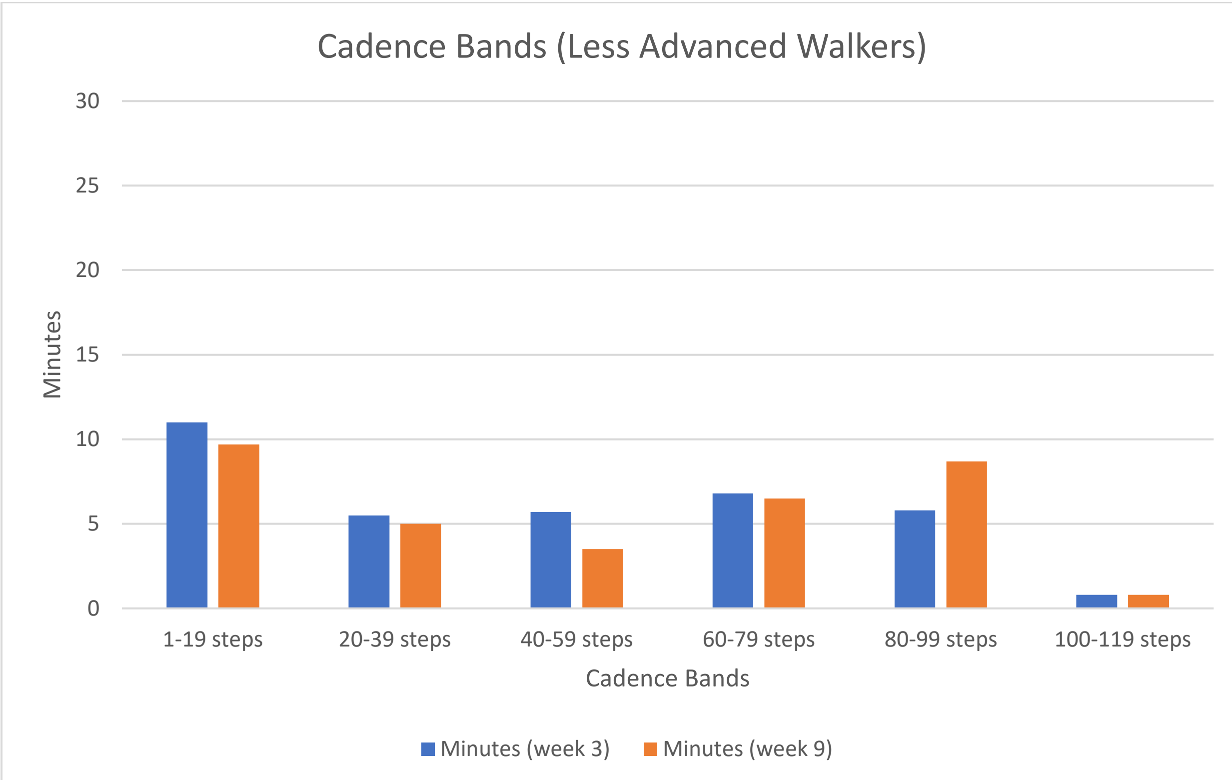
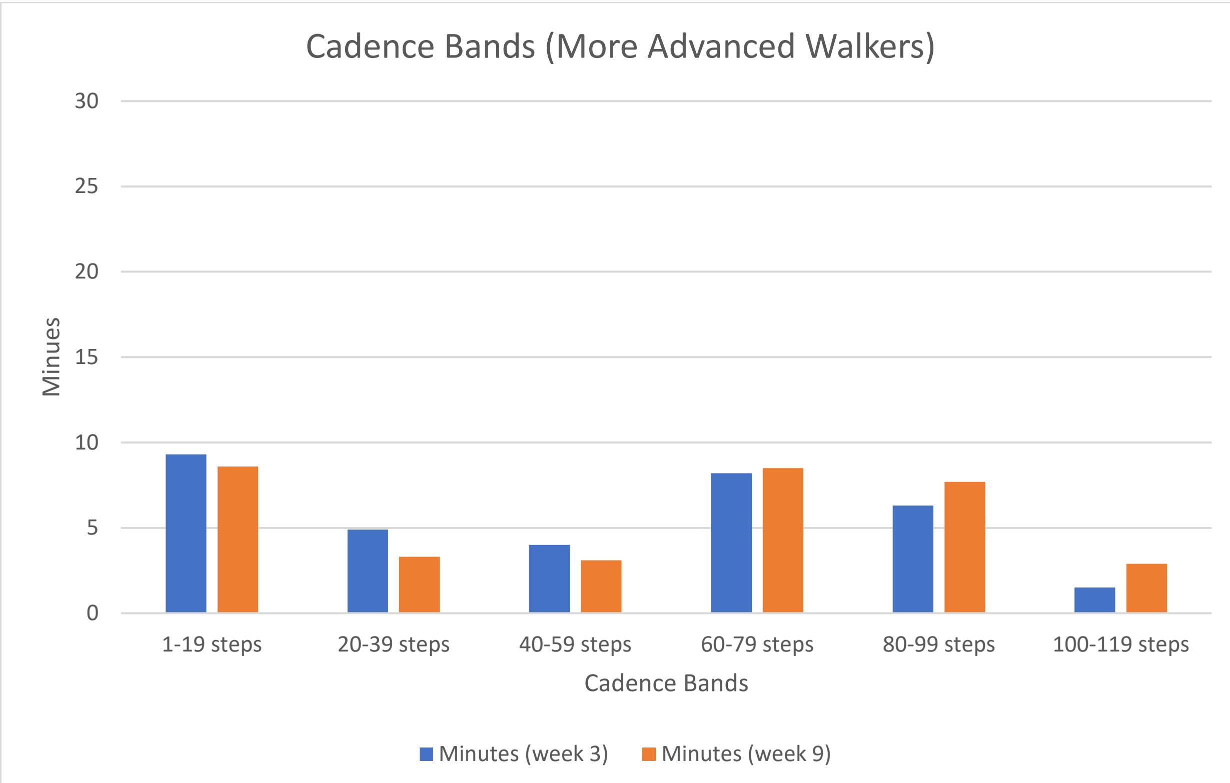


Figure 4. Minutes spent in different cadence bands during the first and the second long walks and the short walking drills in weeks 3 (n=16) and 9 (n=15) (more advanced walkers)



Fidelity of Treatment Delivery

According to the protocol, 20 walking sessions were planned to be held within 10 weeks. However, some sessions were cancelled. In Winnipeg, one session was cancelled due to rain, while in Edmonton, two sessions were cancelled because of poor air quality. Out of the three sessions cancelled in Toronto, one session was cancelled because of hot weather and two were cancelled due to rain. In Montreal, six sessions had to be cancelled (five due to rain and one due to hot weather). This means that in total, across all sites, 87.5% (IQR 20%) of the 20 sessions were actually held. During the walking sessions that were held, temperatures ranged from 13.7ºC to 30.7ºC in Winnipeg, from 15.1ºC to 29.2ºC in Edmonton, from 19.3ºC to 28.7ºC in Toronto, and from 8.3ºC to 26.6ºC in Montreal. In terms of humidity, it ranged from 29% to 81% in Winnipeg, from 32% to 63% in Edmonton, from 33% to 68% in Toronto, and from 44% to 83% in Montreal.

In terms of attendance at non-cancelled sessions, participants in Winnipeg attended 94.7% (IQR 0%), while participants in Edmonton attended 77.8% (IQR 36%) of the sessions. In Toronto and Montreal, participants attended 75.0% (IQR 12.5%) and 83.3% (IQR 33.3%) of the walking sessions, respectively. Across all sites and over all sessions, median attendance per person was 83.3% (IQR 31.6%). In Table 7, attendance is described per session for each research site and for all walking sessions.

Table 7

Attendance per Session

	Winnipeg	Edmonton	Toronto	Montreal	All sites
Week 1, session 1	6/6 (100%)	7/8 (87.5%)	5/8 (62.5%)	5/6 (83.3%)	23/29 (79.3%)
Week 1, session 2	6/6 (100%)	7/8 (87.5%)	7/8 (87.5%)	6/6 (100%)	26/29 (89.7%)
Week 2, session 1	6/6 (100%)	7/8 (87.5%)	5/8 (62.5%)	Cancelled	18/23 (78.3%)
Week 2, session 2	6/6 (100%)	4/8 (50%)	6/8 (75%)	6/6 (100%)	22/29 (75.9%)

	Winnipeg	Edmonton	Toronto	Montreal	All sites
Week 3, session 1	6/6 (100%)	7/8 (87.5%)	Cancelled	6/6 (100%)	19/20 (95%)
Week 3, session 2	6/6 (100%)	6/8 (75%)	3/8 (37.5%)	5/6 (83.3%)	20/29 (69%)
Week 4, session 1	5/6 (83.3%)	5/8 (62.5%)	5/8 (62.5%)	4/6 (66.7%)	19/29 (65.5%)
Week 4, session 2	6/6 (100%)	6/8 (75%)	5/8 (62.5%)	4/6 (66.7%)	21/29 (72.4%)
Week 5, session 1	Cancelled	5/8 (62.5%)	6/8 (75%)	Cancelled	11/17 (64.7%)
Week 5, session 2	6/6 (100%)	4/8 (50%)	6/8 (75%)	4/6 (66.7%)	20/29 (69%)
Week 6, session 1	6/6 (100%)	5/8 (62.5%)	Cancelled	5/6 (83.3%)	16/20 (80%)
Week 6, session 2	6/6 (100%)	5/8 (62.5%)	6/8 (75%)	4/6 (66.7%)	21/29 (72.4%)
Week 7, session 1	6/6 (100%)	3/8 (37.5%)	6/8 (75%)	Cancelled	15/23 (65.2%)
Week 7, session 2	5/6 (83.3%)	5/8 (62.5%)	6/8 (75%)	4/6 (66.7%)	20/29 (69%)

	Winnipeg	Edmonton	Toronto	Montreal	All sites
Week 8, session 1	5/6 (83.3%)	6/8 (75%)	6/8 (75%)	6/6 (100%)	23/29 (79.3%)
Week 8, session 2	5/6 (83.3%)	Cancelled	5/8 (62.5%)	Cancelled	10/15 (66.7%)
Week 9, session 1	5/6 (83.3%)	4/8 (50%)	6/8 (75%)	Cancelled	15/23 (65.2%)
Week 9, session 2	6/6 (100%)	Cancelled	4/8 (50%)	5/6 (83.3%)	15/21 (71.4%)
Week 10, session 1	6/6 (100%)	5/8 (62.5%)	Cancelled	Cancelled	11/14 (78.6%)
Week 10, session 2	6/6 (100%)	3/8 (37.5%)	6/8 (75%)	6/6 (100%)	21/29 (72.4%)
Total (median (IQR))	6 (0.8) 100% (12.5%)	5.2 ± 1.3 (65.3% ± 16.4%)	6 (1) 75% (12.5%)	5 (2) 83.3% (33.3%)	72.4% (11.1%)

The protocol specified that all participants would walk with Nordic poles (for the first and second long walks) in both sessions of weeks 5 and 7. Table 8 shows the number of participants per research site who attended these sessions and how many of them actually used the Nordic poles. Adherence to the Nordic poles was good in week 5 and low in week 7, especially in Toronto.

Table 8

Use of Nordic Poles

	Winnipeg	Edmonton	Toronto	Montreal	All sites
Week 5, session 1	Cancelled	5/5 (100%)	6/6 (100%)	Cancelled	11/11 (100%)
Week 5, session 2	5/6 (83.3%)	4/4 (100%)	5/6 (83.3%)	4/4 (100%)	18/20 (90%)
Week 7, session 1	5/6 (83.3%)	2/3 (66.7%)	0/6 (0%)	Cancelled	7/15 (46.7%)
Week 7, session 2	4/5 (80%)	4/5 (80%)	0/6 (0%)	4/4 (100%)	12/20 (60%)

Each walking session was composed of 5 components: warm-up, first long walk, short walking drills, second long walk, and cool down. The protocol specified that all components would be performed in each walking session in all research sites. Table 9 describes the number of components performed in each session in each site and the median number of components performed per site considering all sessions. The reason why participants in Winnipeg only performed 2 components in the first session of week 1 is that it started raining. Thus, the walking session ended after the first long walk.

Table 9

Number of Components Completed in Each Session in Each Research Site

	Winnipeg	Edmonton	Toronto	Montreal	All sites
Week 1, session 1	2/5 (40%)	4/5 (80%)	4/5 (80%)	5/5 (100%)	4 (1.5) 80% (30%)
Week 1, session 2	4/5 (80%)	5/5 (100%)	5/5 (100%)	5/5 (100%)	5 (0.5) 100% (10%)
Week 2, session 1	4.5/5 (90%)	5/5 (100%)	4/5 (80%)	Cancelled	4.5 (0.8) 90% (15%)
Week 2, session 2	4.5/5 (90%)	5/5 (100%)	5/5 (100%)	5/5 (100%)	5 (0.3) 100% (5%)
Week 3, session 1	5/5 (100%)	5/5 (100%)	Cancelled	5/5 (100%)	5 (0) 100% (0%)
Week 3, session 2	5/5 (100%)	5/5 (100%)	5/5 (100%)	5/5 (100%)	5 (0) 100% (0%)
Week 4, session 1	5/5 (100%)	5/5 (100%)	4.5/5 (90%)	5/5 (100%)	5 (0.3) 100% (5%)
Week 4, session 2	5/5 (100%)	5/5 (100%)	4/5 (80%)	5/5 (100%)	5 (0.5) 100% (10%)
Week 5, session 1	Cancelled	5/5 (100%)	5/5 (100%)	Cancelled	5 (0) 100% (0%)

	Winnipeg	Edmonton	Toronto	Montreal	All sites
Week 5, session 2	5/5 (100%)	5/5 (100%)	4/5 (80%)	5/5 (100%)	5 (0.5) 100% (10%)
Week 6, session 1	4.5/5 (90%)	4/5 (80%)	Cancelled	5/5 (100%)	4.5 (0.8) 90% (15%)
Week 6, session 2	5/5 (100%)	5/5 (100%)	5/5 (100%)	5/5 (100%)	5 (0) 100% (0%)
Week 7, session 1	5/5 (100%)	5/5 (100%)	5/5 (100%)	Cancelled	5 (0) 100% (0%)
Week 7, session 2	5/5 (100%)	5/5 (100%)	5/5 (100%)	5/5 (100%)	5 (0) 100% (0%)
Week 8, session 1	4.5/5 (90%)	4.5/5 (90%)	5/5 (100%)	4/5 (80%)	4.5 (0.8) 90% (10%)
Week 8, session 2	5/5 (100%)	Cancelled	5/5 (100%)	Cancelled	5 (0) 100% (0%)
Week 9, session 1	5/5 (100%)	5/5 (100%)	4/5 (80%)	Cancelled	5 (0.8) 100% (15%)
Week 9, session 2	5/5 (100%)	Cancelled	5/5 (100%)	5/5 (100%)	5 (0) 100% (0%)

Week 10, session 1	5/5 (100%)	4/5 (80%)	Cancelled	Cancelled	4.5 (1) 90% (20%)
Week 10, session 2	5/5 (100%)	5/5 (100%)	5/5 (100%)	5/5 (100%)	5 (0) 100% (0%)
Median (IQR) number of components performed	5 (0.5) 100 % (10%)	5 (0) 100% (0%)	5 (1) 100% (20%)	5 (0) 100% (0%)	5 (0.3) 100% (5%)

Note. When only some of the activities within a component were performed (e.g., due to lack of time), that component was counted as 0.5 instead of 1.0.

Analyzing each component separately, Table 10 characterizes the frequency that each component was performed.

Table 10

Frequency that Each Component Was Performed in Each Research Site

	Winnipeg	Edmonton	Toronto	Montreal	All sites
Warm-up	19/19 (100%)	18/18 (100%)	17/17 (100%)	14/14 (100%)	68/68 (100%)
First walk	18/19 (94.7%)	18/18 (100%)	17/17 (100%)	14/14 (100%)	67/68 (98.5%)
Short walking drills	17.5/19 (92.1%)	15.5/18 (86.1%)	17/17 (100%)	14/14 (100%)	64/68 (94.1%)
Second walk	17/19 (89.5%)	17/18 (94.4%)	12.5/17 (73.5%)	14/14 (100%)	60.5/68 (89%)
Cool down	18.5/19 (97.4%)	18/18 (100%)	17/17 (100%)	13/14 (92.9%)	66.5/68 (97.8%)

Note. The denominator is the total number of sessions held at each site. When only some of the activities within a component were performed (e.g., due to lack of time), that component was counted as 0.5 instead of 1.0.

Comparing distance walked in both the first and the second long walks of weeks 3 and 9 to the distances specified in the protocol, Table 11 shows the results of the equivalence testing. Neither the less advanced walkers nor the more advanced walkers walked within the pre-established boundaries. In general, the less advances walkers walked more than they were expected, whereas the more advanced walkers walked less.

Table 11

Equivalence Testing: Distance Walked (Metres) Compared to the Protocol

	Less Advanced Walkers (225 m, Week 3) Mean ± SD	Less Advanced Walkers (400 m, Week 9) Mean ± SD	More Advanced Walkers (425 m, Week 3) Mean ± SD	More Advanced Walkers (600 m, Week 9) Mean ± SD
First walk (30 m difference)	362.8 ± 89.1 Not equivalent (t=2.955, p=0.984) Power=0 n=6	560.5 ± 97.5 Not equivalent (t=3.273, p=0.989) Power=0 n=6	433.7 ± 107.1 Not equivalent (t=-0.795, p=0.219) Power=0 n=16	546.3 ± 162.1 Not equivalent (t=-0.547, p=0.704) Power=0 n=15
First walk (50 m difference)	362.8 ± 89.1 Not equivalent (t=2.417, p=0.970) Power=0 n=6	560.5 ± 97.5 Not equivalent (t=2.783, p=0.981) Power=0 n=6	433.7 ± 107.1 Not equivalent (t=-1.555, p=0.07) Power=18.63% n=16	546.3 ± 162.1 Not equivalent (t=-0.082, p=0.532) Power=0 n=15

Second walk (30 m difference)	384.1 ± 95.4 Not equivalent (t=3.326, p=0.990) Power=0 n=6	540.6 ± 109.0 Not equivalent (t=2.258, p=0.957) Power=0 n=5	401.7 ± 84.5 Not equivalent (t=0.337, p=0.370) Power=0 n=16	533.8 ± 113.3 Not equivalent (t=-1.025, p=0.834) Power=0 n=10
Second walk (50 m difference)	384.1 ± 95.4 Not equivalent (t=2.811, p=0.981) Power=0 n=6	540.6 ± 109.0 Not equivalent (t=1.856, p=0.931) Power=0 n=5	401.7 ± 84.5 Not equivalent (t=1.257, p=0.114) Power=52.55% n=16	533.8 ± 113.3 Not equivalent (t=-0.456, p=0.671) Power=0 n=10

Note. The 30 and 50 metre difference were summed to and subtracted from the distance specified in the protocol to create the lower and the upper equivalence boundaries, respectively.

Tables 12 and 13 display the percentage of the less advanced and the more advanced walkers, respectively, who walked within the equivalence boundaries in week 3. In general, even though some participants followed the protocol, especially in the more advanced walking group, most of them did not walk within the distance boundaries established for the equivalence testing.

Table 12

Frequency of Participants Who Walked Between 195-255 Metres (±30 m Difference) and 175-275 Metres (±50 m Difference) in Week 3 (Less Advanced Walkers, n=6)

	Walk 1 (195-255 m) Frequency (%)	Walk 2 – (195-255 m) Frequency (%)	Walk 1 (175-275 m) Frequency (%)	Walk 2 (175-275 m) Frequency (%)
Yes	1 (16.7%)	0 (0%)	1 (16.7%)	0 (0%)
No (exceeded protocol)	5 (83.3%)	6 (100%)	5 (83.3%)	6 (100%)
No (fell below protocol)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Note. m = metres.

Table 13

Frequency of Participants Who Walked Between 395-455 Metres (±30 m Difference) and 375-475 Metres (±50 m Difference) in Week 3 (More Advanced Walkers, n=16)

	Walk 1 (395-455 m) Frequency (%)	Walk 2 (395-455 m) Frequency (%)	Walk 1 (375-475 m) Frequency (%)	Walk 2 (375-475 m) Frequency (%)
Yes	10 (62.5%)	5 (31.3%)	10 (62.5%)	6 (37.5%)
No (exceeded protocol)	2 (12.5%)	3 (18.8%)	2 (12.5%)	3 (18.8%)
No (fell below protocol)	4 (25%)	8 (50%)	4 (25%)	7 (43.8%)

Note. m = metres.

Tables 14 and 15 show the percentage of the less advanced and the more advanced walkers, respectively, who walked within the equivalence boundaries in week 9. The percentage of participants who walked within the distances specified for the equivalence testing was low (30% or less) in both groups.

Table 14

Frequency of Participants Who Walked Between 370-430 Metres (±30 m Difference) and 350-450 (±50 m Difference) Metres in Week 9 (Less Advanced Walkers, n=6)

	Walk 1 (370-430 m) Frequency (%)	Walk 2 (370-430 m) Frequency (%)	Walk 1 (350-450 m) Frequency (%)	Walk 2 (350-450 m) Frequency (%)
Yes	1 (16.7%)	1 (20%)	1 (16.7%)	1 (20%)
No (exceeded protocol)	5 (83.3%)	4 (80%)	5 (83.3%)	4 (80%)
No (fell below protocol)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Note. m = metres. One participant in Toronto did not perform the second long walk.

Table 15

Frequency of Participants Who Walked Between 570-630 Metres (±30 m Difference) 550-650 Metres (±50 m Difference) in Week 9 (More Advanced Walkers, n=15)

	Walk 1 (570-630 m) Frequency (%)	Walk 2 – (570-630 m) Frequency (%)	Walk 1 (550-650 m) Frequency (%)	Walk 2 (550-650 m) Frequency (%)
Yes	1 (6.7%)	3 (30%)	2 (13.3%)	3 (30%)
No (exceeded protocol)	4 (26.7%)	3 (30%)	4 (26.7%)	2 (20%)
No (fell below protocol)	10 (66.7%)	4 (40%)	9 (60%)	5 (50%)

Note. m = metres. Five participants in Toronto did not perform the second long walk.

Table 16 displays the results of the equivalence testing for the less advanced and the more advanced walkers in terms of duration of the components of the sessions. In general, duration of each component was not considered equivalent to the duration specified in the protocol except for the first and the second long walks in week 3, the cool down in both weeks, and the total duration of the session in both weeks in the more advanced walking group.

Table 16

Equivalence Testing: Duration (Minutes) of Each Component of the Session Compared to the Protocol

	Less Advanced Walkers (Week 3) Mean ± SD	Less Advanced Walkers (Week 9) Mean ± SD	More Advanced Walkers (Week 3) Mean ± SD	More Advanced Walkers (Week 9) Mean ± SD
Warm-up (2 min difference from protocol specifications)	11.3 ± 1.4 Not equivalent (t=-1.228, p=0.137) Power=93.68% n=6	11.7 ± 2.6 Not equivalent (t=-0.285, p=0.394) Power=19.11% n=6	11.2 ± 2.4 Not equivalent (t=-1.32, p=0.103) Power=90.61% n=16	11.6 ± 3.7 Not equivalent (t=-0.417, p=0.342) Power=34.5% n=15
First walk (2 min difference)	9.5 ± 2.2 Not equivalent (t=1.717, p=0.073) Power=44.1% n=6	15.5 ± 5.2 Not equivalent (t=1.66, p=0.921) Power=0% n=6	10.8 ± 1.9 Equivalent (t=-2.516, p=0.012) Power=98.94% n=16	12.7 ± 4.9 Not equivalent (t=0.546, p=0.703) Power=0% n=15

Short walking drills (4 min difference)	18.2 ± 4.7 Not equivalent (t=1.144, p=0.152) Power=33.82% n=6	14.8 ± 1.3 Not equivalent (t=-2.254, p=0.963) Power=100% n=6	15.2 ± 5.0 Not equivalent (t=-0.64, p=0.734) Power=88.01% n=16	16.6 ± 3.6 Not equivalent (t=0.641, p=0.266) Power=99.2% n=15
Second walk (2 min difference)	10.3 ± 2.1 Not equivalent (t=-1.977, p=0.052) Power=50.49% n=6	12.3 ± 4 Not equivalent (t=0.168, p=0.563) Power=0% n=5	10.4 ± 2.0 Equivalent (t=-3.2, p=0.003) Power=98.15% n=16	11.1 ± 3.6 Not equivalent (t=-0.805, p=0.221) Power=10.09% n=10
Cool down (2 min difference)	11.6 ± 2.1 Not equivalent (t=-0.461, p=0.332) Power=50.49% n=6	8.8 ± 2.4 Not equivalent (t=0.738, p= 0.251) Power=16.76% n=5	9.8 ± 3.1 Equivalent (t=2.342, p=0.017) Power=66.05% n=16	10.7 ± 2.5 Equivalent (t=-2.014, p=0.032) Power=85.39% n=15
Total (6 min difference)	61.2 ± 6.7 Not equivalent (t=-1.766, p=0.069)	59.6 ± 10.5 Not equivalent (t=1.303, p=0.125)	57.5 ± 7.7 Equivalent (t=1.821, p=0.044)	59.0 ± 6.0 Equivalent (t=3.227, p=0.003)

	Power=42.44% n=6	Power=0% n=6	Power=85.98% n=16	Power=97.41% n=15

Note. Duration specified in the protocol for each component of the session: 10 minutes for the warm-up, 10 minutes for the first long walk, 20 minutes for the short walking drills, 10 minutes for the second long walk, and 10 minutes for the cool down; min = minutes.

Tables 17 and 18 describe the percentage of the less advanced and the more advanced walkers, respectively, who walked within the time frame established for the equivalence boundaries in week 3. In both groups, 50% or more performed the activities within the time frame specified in the protocol in the warm-up, the short walking drills, the second long walk, and the entire session.

Table 17

Frequency of Participants Who Walked Within the Time Frames Established for the Equivalence Testing in Week 3 (Less Advanced Walkers, n=6)

	Warm-up (8-12 min)	First walk (8-12 min)	Short walking drills (16-24 min)	Second walk (8-12 min)	Cool down (8-12 min)	Entire session (54-66 min)
Yes	5 (83.3%)	2 (33.3%)	5 (83.3%)	4 (66.7%)	3 (50%)	5 (83.3%)
No (exceeded protocol)	1 (16.7%)	1 (16.7%)	0 (0%)	1 (16.7%)	3 (50%)	0 (0%)
No (fell below protocol)	0 (0%)	3 (50%)	1 (16.7%)	1 (16.7%)	0 (0%)	1 (16.7%)

Note. min = minutes.

Table 18

Frequency of Participants Who Walked Within the Time Frames Established for the Equivalence Testing in Week 3 (More Advanced Walkers, n=16)

	Warm-up (8-12 min)	First walk (8-12 min)	Short walking drills (16-24 min)	Second walk (8-12 min)	Cool down (8-12 min)	Entire session (54-66 min)
Yes	10 (62.5%)	8 (50%)	9 (56.3%)	13 (81.3%)	7 (43.8%)	10 (62.5%)
No (exceeded protocol)	5 (31.3%)	7 (43.8%)	0 (0%)	1 (6.3%)	4 (25%)	0 (0%)
No (fell below protocol)	1 (6.3%)	1 (6.3%)	7 (43.8%)	2 (12.5%)	5 (31.3%)	6 (37.5%)

Note. min = minutes.

Tables 19 and 20 show the percentage of the less advanced and the more advanced walkers, respectively, who walked within the time frame established for the equivalence boundaries in week 9. In the less advanced walking group, 66.7% or more met the criteria for the duration of the warm-up and the cool down. In the more advanced walking group, 53.3% or more performed the activities within the pre-established time frame in the short walking drills, the second long walk, the cool down, and the entire session.

Table 19

Frequency of Participants Who Walked Within the Time Frames Established for the Equivalence Testing in Week 9 (Less Advanced Walkers, n=6)

	Warm-up (8-12 min)	First walk (8-12 min)	Short walking drills (16-24 min)	Second walk (8-12 min)	Cool down (8-12 min)	Entire session (54-66 min)
Yes	4 (66.7%)	1 (16.7%)	1 (16.7%)	1 (20%)	3 (60%)	2 (33.3%)
No (exceeded protocol)	2 (33.3%)	4 (66.7%)	0 (0%)	3 (60%)	0 (0%)	2 (33.3%)
No (fell below protocol)	0 (0%)	1 (16.7%)	5 (83.3%)	1 (20%)	2 (40%)	2 (33.3%)

Note. min = minutes. One participant in Toronto did not perform the second long walk and the cool down.

Table 20

Frequency of Participants Who Walked Within the Time Frames Established for the Equivalence Testing in Week 9 (More Advanced Walkers, n=15)

	Warm-up (8-12 min)	First walk (8-12 min)	Short walking drills (16-24 min)	Second walk (8-12 min)	Cool down (8-12 min)	Entire session (54-66 min)
Yes	7 (46.7%)	4 (26.7%)	9 (60%)	6 (60%)	8 (53.3%)	8 (53.3%)
No (exceeded protocol)	7 (46.7%)	8 (53.3%)	0 (0%)	2 (20%)	4 (26.7%)	2 (13.3%)
No (fell below protocol)	1 (6.7%)	3 (20%)	6 (40%)	2 (20%)	3 (20%)	5 (33.3%)

Note. min = minutes. Five participants in Toronto did not perform the second long walk.

Fidelity of Provider Training

Principal investigators developed an agenda with all the important topics that had to be covered during the training of the walking leaders, which was conducted by telephone. All the topics were addressed and walking leaders had the opportunity to clarify any questions they had. This telephone meeting was held in June, 2018 to review the components of the conceptual framework for the GO-OUT trial (Patla's Dimensions of Mobility) (Patla & Shumway-Cook, 1999), the purpose of the GO-OUT outdoor walking groups, and the roles and responsibilities of the walking leaders and assistants. Principles for planning the outdoor sessions were also discussed (e.g., participants' safety was a priority, the protocol was progressive, the program had to be flexible to adjust the activities to participants' limitations and needs). A safety guide was developed to ensure participants' safety during the outdoor walking sessions. The document includes many recommendations for walking leaders and assistants ranging from appropriate footwear to proper use of walking aids during the sessions. All these recommendations were reviewed during this initial telephone meeting with the walking leaders. Lastly, the principal investigators talked about the weekly exercises and gave some examples on how they should be conducted. In addition to the telephone meeting, the principal investigator from Toronto observed one walking session (week 7) to determine whether the intervention was being conducted as per protocol and to provide some feedback for the walking leader. The principal investigator reported that the all five components were completed and that the most important aspects of the protocol were met. The only drift from the protocol was the fact that none of the participants used Nordic walking poles as it was specified in the protocol for week 7. The reason why this happened was that most of participants in the group were mobility aid users and it was safer for them to use their usual mobility aids rather than try the Nordic poles.

Walking leaders kept reflective notes in Winnipeg, Edmonton, and Toronto after each walking session. In Winnipeg, even though participants were divided into two groups (less advanced and more advanced walkers) and the protocol differed for the two groups, participants were allowed to choose which protocol to follow in each session. Therefore, participants who were categorized in the less advanced walking group (based on their baseline 10 m gait speed) did not necessarily always follow the protocol for the less advanced walkers and vice-versa. In week 1, participants did not perform the long walks and the short walking drills in the first session and did not finish the second long walk in the second session due to rain (see Table 9). Additionally, everyone walked the shorter distance for the second long walk in the second session of week 2 because the temperature was hot outside. In week 6, session 2 the distances were measured incorrectly, so participants ended up walking more than the distances specified in the protocol. In Edmonton, from week 4 to week 10, the order of the components was changed; the first and the second long walks were performed together with a short rest in between. The walking leader said that the walks were combined because the participants seemed to prefer doing them together. In addition, she said that she felt the protocol was not always sufficiently challenging for the participants. In Toronto, participants verbalized a few times that they needed to take more breaks when the weather was hot. In addition, the walking leader said that walking aid users experienced some difficulty using Nordic poles for an extended period of time, so they needed to switch back to using their walking aids halfway during the long walks. Walking leaders from all sites (Winnipeg, Edmonton, and Toronto) reported that it was difficult to complete all the activities within 60 minutes, especially towards the end of the intervention, when participants had to walk longer distances. They also commented on the challenges of conducting the walking sessions with the more advanced and the less advanced walkers performing activities together. Because participants from both groups walked different distances, usually one group finished the walks before the other and thus, they would have to wait for the other group.

Fidelity of Study Design

In 2015, a 9-week pilot study (Barclay et al., 2018) related to the current GO-OUT study was conducted in Winnipeg. Because all participants (n=9, age ≥65 years) included in the pilot achieved gait speeds >0.8 m/s in the 10 mWT, only the protocol for the more advanced walking group was tested in this pilot study. The principal investigator attended many walking sessions to observe the delivery of the intervention and provide some feedback to the walking leader. The results from the pilot showed that the intervention was safe and that the protocol was feasible.

In terms of the study protocol (Salbach et al., 2019), it was very specific in terms of the activities that were planned for each component of the sessions and their dose. Additionally, all the suggested activities for each walking session were based on the dimensions of mobility developed by Patla and Shumway-Cook (1999). For example, some activities involved walking as fast as possible (as if participants were crossing the street) while carrying a load and having to memorize a grocery list while walking. The safety guidelines also provided important information for the walking leaders and assistants, such as how to deal with signs of fatigue and poor balance. The goal of these recommendations was to ensure participants' safety, which was the main principle of the study protocol.

Discussion

The purpose of this study was to analyze the fidelity of the supervised outdoor walking sessions of the GO-OUT study. Analyzing fidelity, the extent to which an intervention is conducted as intended (Moncher & Prinz, 1991), is important because it determines the internal and the external validity of the results (Borrelli et al., 2005). In addition, research shows that interventions that are delivered with a high degree of fidelity are usually more effective than interventions that are delivered with a low degree of fidelity (Raedeke & Dlugonski, 2017;

Rovniak et al., 2005). In this study, fidelity of treatment delivery, provider training, and study design were measured in different ways, using both quantitative (GPS devices, activity monitors, process indicator documents, and implementation fidelity forms) and qualitative (reflective notes, observation) assessment tools. Overall, many recommendations from the literature (Bellg et al., 2004; Borrelli, 2011) were followed to maintain fidelity of treatment delivery (i.e., the components of the sessions were performed on a consistent basis, the progressiveness of the protocol was respected, and attendance rates were high) and study design (i.e., the protocol was related to the hypotheses of the study and specified all the activities that should be performed and their dose, documents were developed to avoid drifts from the protocol, and the results from the pilot study showed the protocol was feasible). In terms of fidelity of provider training, even though some recommendations were followed (Bellg et al., 2004; Borrelli, 2011), some aspects could have been improved.

In this study, attendance rates were high, which positively impacted degree of fidelity of treatment delivery. The median number of non-cancelled sessions attended per person ranged from 73.6% (IQR 40.9%) in Toronto to 94.7% (IQR 0%) in Winnipeg. Considering all research sites, the median percentage of sessions attended per person was 83.3% (IQR 31.6%). This is in accordance with the literature on walking interventions that reported attendance rates ranging from 42.7% (mean) to 83.3% (median) (Ada, Dean, & Lindley, 2013; Park, Koh, Yang, & Shim, 2017; Tappen et al., 2000).

Another important aspect of the protocol was its progressiveness in terms of distances walked, gait speeds, and complexity of the activities performed in the short walking drills. Even though distances achieved in the long walks (Table 11) and duration of each component of the session (Table 16) were not equivalent to the protocol, participants were able to follow the progressiveness of the protocol (see Table 6), which shows that the intent of the protocol was achieved. Another finding that might indicate that participants followed the progressiveness of the protocol is the time they spent in different cadence bands in both walking sessions. Although we did not perform paired t-tests to compare cadence values between weeks, the less advanced (Figures 1 and 3) and the more advanced walkers (Figures 2 and 4) seemed to spend more minutes in higher cadence bands in week 9 than they did in week 3. These findings are in accordance with the study of Resnick et al. (2011), in which the purpose was to determine fidelity of a treadmill intervention that aimed to improve motor learning and aerobic fitness in patients with chronic stroke. The protocol specified that participants would start walking on the treadmill for 10–20 minutes at 40–50% of maximal heart rate reserve and gradually progress the intensity and duration of walking according to their tolerance. The goal was to achieve 35 minutes walking on the treadmill at 60–70% maximal heart rate reserve. Even though only 48% of the sample was able to meet the protocol specifications in terms of walking intensity and none of them were able to maintain the intensity for 35 minutes, participants were able to progress during the study and thus, gradually improve walking intensity and duration.

These findings demonstrate that developing a protocol and specifying all the activities that will be performed including their intensity and duration can be very challenging. Even though researchers have a target population that has similar characteristics (e.g., older adults with an outdoor community mobility limitation), it does not mean that all participants will have the same needs and limitations. Some participants may be able to meet the intensity and the duration of the activities, but many of them may not. Thus, although meeting all the protocol specifications is important, it may not be reasonable to expect that researchers will be able to choose exactly the right intensity and duration of activities that all participants will be able to meet. These protocol specifications are “ballpark” estimates meant to guide treatment providers so that they understand the researchers’ expectations in terms of exercise intensity and duration. Therefore, the fact that participants did not necessarily meet the protocol in terms of distance and duration may not have affected fidelity of treatment delivery to a large extent, considering that participants’ distances walked and gait speeds increased.

In addition to high attendance rates and meeting the progressiveness of the protocol, participants also performed most of the components (5.0 (IQR 0.3)) in each walking session (as seen in Table 9), which indicates that the protocol was followed and that almost all the intended activities were performed in each session. The component that was most commonly left out was the second long walk, especially in Toronto (Table 10), and the reason was lack of time. In general, because the protocol was progressive in terms of distances walked in the long walks and complexity of the short walking drills, participants took longer to complete the activities over the weeks. Even though gait speed was higher in week 9 compared to week 3 (Table 6), it was still insufficient to meet the protocol demands. Considering the distance and the duration specified in the protocol for the long walks in week 3, the less advanced and the more advanced walkers were expected to walk at gait speeds of at least 0.4 m/s and 0.7 m/s, respectively, which was easily met. However, in week 9, the less advanced and the more advanced walkers needed to walk at gait speeds of at least 0.7 m/s and 1.0 m/s, respectively, to finish the long walks on time. Since participants’ gait speeds in the first long walk of week 9 were lower than that (0.6 (IQR 0.3) in the less advanced walkers and 0.7 (IQR 0.3) in the more advanced walkers), some participants spent more than 10 minutes completing the first long walk, and thus, the group did not have time to perform the second long walk.

This was even more evident in Toronto because participants from this research site were slower walkers. In week 9, the median (IQR) gait speed that participants in Toronto, Winnipeg, Edmonton, and Montreal achieved in the first long walk was 0.6 (0.2) m/s, 0.6 (0.1) m/s, 0.9 (0.1) m/s, and 0.8 (0.1) m/s, respectively. Therefore, participants from Toronto and Winnipeg walked slower than participants in Edmonton and Montreal. Even though gait speeds were similar in Toronto and Winnipeg, participants in Winnipeg were able to complete more second long walks than participants in Toronto. This is because the walking leader in Winnipeg chose to conduct the short walking drills faster than usual (as reported in the reflective notes), so that there was still some time left to perform the second long walk. In addition, in some walking sessions, all participants walked the shorter distance (i.e., the distance specified for the less advanced group) in the second long walk so they would be able to finish the session on time (data from the reflective notes). On the other hand, the walking leader in Toronto focused on completing all the activities within each component as were specified in the protocol, which caused them not to have enough time to perform the second long walks in some weeks. Therefore, even though most of the components of the sessions were performed across all sites, the fact that the walking leaders chose different approaches to solve the same problem (lack of time) might reflect a lower degree of fidelity in terms of provider training.

Other drifts from the protocol also indicate that fidelity of provider training could have been improved. The findings from the qualitative data determined that the order of the components was changed in Edmonton from week 4 to week 10. Participants performed the two long walks consecutively with a short rest in between instead of performing the first walk, the short walking drills and then the second walk. This may reflect that participants in Edmonton had higher levels of physical function than participants in the other research sites as they were able to perform both walks together and did not need more time to recover before performing the second walk. In Table 3, we can see that participants from Edmonton achieved a higher gait speed in the 10 mWT, walked longer distances in the 6 MWT, and scored better in the Ambulatory Self-Confidence scale at baseline compared to participants at other sites. In the reflective notes, the walking leader from Edmonton reported a few times that she felt that the activities were not sufficiently challenging for participants. All these findings may indicate that participants in Edmonton indeed were more physically capable than the rest of the sample, which may explain why the walking leader in that research site decided to combine the walks and make it more challenging for participants.

The qualitative data also yielded that the walking leader in Winnipeg allowed participants in each session to choose whether they wanted to follow the protocol for the less advanced or the more advanced walkers. Thus, participants from the less advanced walking group sometimes followed the protocol for the more advanced walking group and vice-versa. The problem with this approach is that there was no consistency within each group. Instead of always improving distance walked, in one session participants could walk more if they wanted and the next session they could walk less.

These drifts from the protocol could be a consequence of certain aspects of the training of the walking leaders. One of the most important factors to maintaining treatment fidelity of an intervention is the training of the staff (Bellg et al., 2004; Borrelli, 2011), especially in a multi-centre study where each research site has different individuals conducting the intervention. In this project, we observed that the GO-OUT study followed many recommendations seen in the literature to maintain a high degree of fidelity of provider training (Bellg et al., 2004; Borrelli, 2011). The recommendations are that principal investigators hire treatment providers with similar backgrounds and experiences and that treatment providers receive the same training, which means they should receive standardized materials and resources, train together, and practice treatment implementation with pilot participants (Bellg et al., 2004; Borrelli, 2011). In the GO-OUT study, principal investigators hired registered health professionals (e.g., physical therapists, occupational therapists, kinesiologists) with at least two years of experience prescribing exercise to individuals with mobility limitations (e.g., poor balance, slow walkers, walking aid users). In addition, the walking leaders received the same training and received standardized documents that provided recommendations regarding the walking sessions. The walking leader from Winnipeg conducted the pilot study in 2015, which helped her gain some knowledge on what worked and what did not work during the sessions. Her knowledge and experience with conducting the walking sessions was shared with the other walking leaders during the training session in 2018. The recommendations also say that principal investigators should observe the training sessions and some of the actual sessions and conduct additional training sessions throughout the intervention (Bellg et al., 2004; Borrelli, 2011). This is important to ensure that treatment providers deliver the same treatment and maintain the same level of performance observed in the training sessions (Bellg et al., 2004; Borrelli, 2011). In the GO-OUT study, the principal investigators led the training session and discussed many important topics with the walking leaders. The principal investigator from Toronto also attended one walking session and provided feedback to the walking leader. In this walking session, she observed that the intervention was delivered according to plan. In Winnipeg, many walking sessions were observed in the pilot study and all went according to the protocol. However, walking sessions were not observed in Edmonton and Montreal, and no additional training sessions were conducted throughout the intervention. If extra meetings with the walking leaders had occurred throughout the intervention process to discuss problem-solving and other important topics, some of the drifts from the protocol may have been avoided. For example, recommendations on how to deal with certain challenges during the walking sessions (e.g., lack of time) could have been made to avoid each walking leader addressing issues in their own way.

In terms of study design, the theoretical framework developed by Patla and Schmway-Cook (1999) informed the development of all the components included in the GO-OUT outdoor walking sessions and all the activities were based on the dimensions of mobility. Thus, the hypotheses of the GO-OUT study were tested with the implementation of the study protocol. The study protocol was also very specific and clear about the activities that should be performed and their intensity and duration. It also provided many recommendations for each week of the study to ensure that the most important aspects would be performed while maintaining participants' safety. Furthermore, the pilot study conducted in 2015 (Barclay et al., 2018) contributed to fidelity of study design. Although the results showed that the protocol was feasible, some aspects of it were improved based on the walking leader experience and participants' feedback. Finally, the main priority of the study protocol was to ensure participants' safety while they engaged in outdoor walking. To ensure that this was maintained throughout the intervention, documents were developed for the walking leaders and assistants to guide them on how to monitor safety.

Although many aspects of the development of GO-OUT study contributed to fidelity of study design, one aspect of the development of the study protocol could have been done differently. When principal investigators designed the study protocol, they made different recommendations for participants based on their usual gait speed at baseline, which was measured with the 10 mWT. Thus, participants were classified into the less advanced or the more advanced walking groups. Because the more advanced and the less advanced walkers only showed small differences in gait and PA parameters (e.g., distance walked, steps taken, gait speed) between each other during the walking sessions, it may not have been necessary to divide participants into two groups. Additionally, the fact that less advanced walkers in Winnipeg sometimes followed the protocol for the more advanced walkers and vice-versa demonstrates that they both could have followed the same protocol.

Even though the 10 mWT (Storey et al., 2013), the 6 MWT (Nordanstig et al., 2014; Storey et al., 2013), and other indoor tests such as the timed up-and-go and the stair-climb test (Storey et al., 2013) have been found to be moderately correlated with outdoor walking capacity, they may not reflect outdoor walking performance in a "real life" situation, in which individuals often engage in dual task activities (Patla & Shumway-Cook, 1999). Walking outdoors involves a series of challenges, such as crossing the street, changing positions, walking on different terrain, and coping with attentional demands (e.g., talking to other people while walking) (Patla & Shumway-Cook, 1999), which are not addressed in the 10 mWT. The walking sessions of the GO-OUT study were designed to be as close as possible to "real life" situations and that is why most activities involved dual tasking. During the first and the second long walks of the GO-OUT study, participants were encouraged to talk to each other while they walked. In the activities performed in the short walking drills, they performed a series of tasks while they walked. For example, activities involved carrying bags with cans inside of them while walking at a faster speed and walking through a crowd (one participant walked in one direction while the rest of the group walked in the opposite direction) at a faster speed.

As older adults usually demonstrate reduced gait speed (Hausdorff, Schweiger, Herman, Yogev-Seligmann, & Giladi, 2008; Smith, Cusack, Cunningham, & Blake, 2017), cadence (Smith et al., 2017), mobility (measured with the 10 mWT, the TUG, and the Four Square Step test) and cognitive performance (measured with arithmetic tasks) (Brustio, Magistro, Zecca, Rabaglietti, & Liubicich, 2017) during dual task activities compared to simple task activities, a simple walk indoors (10 mWT) may not fully predict performance in dual task activities outdoors. Thus, an assessment tool to examine performance in dual task activities could have been included at baseline to more truly determine the more advanced and less advanced walkers for categorization in groups for the outdoor walking sessions.

Previous research has analyzed performance in dual task activities both indoors and outdoors. Ferrucci et al. (2000) reported several gait assessments that they developed for the InCHIANTI study to analyze walking capacity in older adults. Many activities conducted indoors involved dual tasking, such as walking while talking to another person, walking and stepping over obstacles, and walking and carrying a load. Sessford et al. (2015) conducted some of these tests outdoors to analyze walking performance of older adults in the community. Therefore, since there are assessment tools to analyze performance in dual task activities outdoors that have already been used in previous research studies, this variable could have been measured at baseline in the GO-OUT study. If these tests had been conducted, the researchers may have observed similar results among participants and thus may have decided to design the protocol for only one group of walkers.

In addition to analyzing performance on dual task activities outdoors, self-efficacy scores may determine performance in outdoor activities that involve dual tasking in older adults (Sessford et al., 2015). Older adults with lower self-efficacy scores for community mobility may have more difficulties performing complex activities outdoors compared to older adults with higher self-efficacy scores (Sessford et al., 2015). Therefore, it would also have been appropriate to consider the self-efficacy scores (Ambulatory Self Confidence Questionnaire) measured at baseline of the GO-OUT study in the determination of less advanced and more advanced walkers. Some of the items in this questionnaire include confidence to walk while carrying a bag, confidence to walk and talk to another person, and confidence to cross the street within a limited time.

Analyzing participants' self-efficacy scores, we observed that scores were higher in the more advanced walkers (8.4 (IQR 2.3)) compared to the less advanced walkers (6.9 (IQR 1.5)). However, when participants' scores were input into SPSS to generate a boxplot, the score of one participant from the less advanced walking group (3.3 out of 10.0) was considered to be an outlier (Q1 - (IQR * 1.5), Q3 + (IQR * 1.5)) (Leech, Barrett, & Morgan, 2015). Even though no minimal clinically important difference has been published for the ASCQ, when we excluded this score from the analysis, the median scores of both groups were quite similar (7.5 (1.5) in the less advanced walking group and 8.4 (2.3) in the more advanced walking group). Therefore, if self-efficacy scores had been used to categorize participants into less advanced and more advanced walkers, the researchers may not have found significant differences among participants and thus, may have decided to supervise only one group in the outdoor walking sessions. Because no striking differences were observed between groups in terms of gait and PA parameters in weeks 3 and 9 and self-efficacy scores at baseline, it is questionable whether having two groups in the walking sessions was actually necessary and beneficial.

Although drifts from the protocol were observed in the GO-OUT outdoor walking group, some drifts are expected in physical therapy interventions as there is a need to individualize the treatment (Toomey et al., 2016; Toomey, Matthews, & Hurley, 2017). Even though the protocol should be followed in theory, when dealing with people, especially older adults with physical limitations, treatment providers must respect their limitations and always adapt the protocol to ensure their safety. It is acceptable that treatment providers adapt the protocol to participants' needs if they do not go against the theoretical framework that informed the development of the treatment protocol (Mowbray et al., 2003). In addition, treatment providers must also allow participants to choose activities they would like to perform and omit activities they do not feel safe or comfortable doing (Paulson et al., 2002). Participants are more likely to trust treatment providers and engage in the treatment if they feel they are being heard (Paulson et al., 2002). For example, adherence to using the Nordic poles was low in sessions 1 and 2 of week 7; only 50% and 60% of participants used them, respectively (Table 8). As 13 participants (46.4%) used walking aids across all sites, the walking leaders may have suggested that some participants not try using the poles for safety reasons. Drifts from the protocol in terms of distance walked could not have been prevented either. If less advanced walkers wanted to walk longer distances, the walking leaders could not (and should not) have asked them to stop walking, especially knowing that walking further would benefit them. If the more advanced walkers could not complete an activity due to pain or fatigue, for example, walking leaders had to allow them to rest. Furthermore, bad weather (e.g., rain, hot weather, poor air quality) prevented some sessions from being conducted and also caused participants to feel more tired during the sessions. Therefore, some drifts from the protocol could not have been avoided as walking leaders did not have control over the weather and participants' physical limitations. However, it is important to define clear differences between necessary drifts from the protocol and unnecessary ones.

Even though treatment providers must be flexible and try to adapt the protocol to participants' limitations, this does not mean that participants and/or walking leaders should choose exactly what they want to do and how they want to do it. For example, in Edmonton, the walking leader changed the order of the components, while in Winnipeg, participants chose which protocol they wanted to follow in each session. These two drifts from the protocol could have been avoided. In Edmonton, changing the order of the components was not necessary to maintain participants' safety. In addition, in Winnipeg, participants in the less advanced walking group could have been oriented to walk the distances specified in the protocol for the less advanced walkers. The same could have happened with the more advanced walkers. To ensure participants' safety and choice, walking leaders could have informed participants that they were allowed to rest when they needed and walk the distances they were able to walk; if they could not complete a walk, they could rest and wait for the next activity; if they wanted to walk more, they could do it if there was still time left for that activity. It is possible to provide participants with a goal for each session and respect their limits and choices at the same time. Therefore, treatment providers should always use their common sense to differentiate between a necessary drift from the protocol and an unnecessary one. This topic should also be addressed in the training of the staff, so that principal investigators can discuss with treatment providers how to find a balance between participants' safety and choice and protocol recommendations.

Strengths of this study include the use of objective tools (activity monitors and GPS devices) to analyze distances, gait speed and duration of each component of the session and the use of a qualitative tool to explore more in-depth information from the walking sessions. Using both quantitative and qualitative tools to analyze treatment fidelity may enrich the understanding of the findings (Toomey et al., 2017). Furthermore, since most randomized controlled trials do not report on fidelity (Lambert et al., 2017; Moncher & Prinz, 1991), the fact that this study measured and reported on three domains of treatment fidelity must be acknowledged. Lastly, this analysis was conducted while the study was ongoing, which makes this study of fidelity rather unique.

In terms of limitations, the small sample size limited statistical analysis, which resulted in low power in the equivalence testing and the inability to conduct t-tests to compare the more advanced and the less advanced walking groups. Since data collection with GPS and activity monitors only happened in two walking sessions of the GO-OUT intervention, no conclusions can be made in terms of duration of each component of the session and distances walked in the other walking sessions. The preferable method of fidelity assessment is considered to be observation of sessions by principal investigators or research assistants (Hill, Maucione, & Hood, 2007). However, since observation may not be feasible in many studies, especially when sessions are held in different cities (Hill et al., 2007), this assessment tool was not used in this study in all research sites. In addition, sporadic active time (number of 5 s epochs with at least 2 steps) could not be analyzed in the Montreal data in week 9 as the GPS devices were mistakenly set to collect data at every 10 s instead of every 1 s. Reflective notes were not collected in Montreal either, so we could not fully analyze fidelity of provider training in this research site. In this study, we only measured fidelity of the supervised outdoor walking sessions; fidelity of the workshop and fidelity of the calls made to participants in the weekly reminders group were not measured. However, the GO-OUT researchers collected information on treatment fidelity of the workshop by filling out the workshop process indicators form. This form provided information on attendance and the number of stations attended per participant. Fidelity of the weekly reminder group was measured using the weekly reminders implementation fidelity form, which collected information on whether participants used their booklet during the call and whether the person making the calls followed the script. Finally, the other two components of fidelity, treatment receipt and enactment were not measured in this study. However, during the individual interviews conducted after the intervention as part of the assessments of the GO-OUT study, some information from these two domains was reported by the participants.

Conclusion

Important recommendations from the literature (Bellg et al., 2004; Borrelli, 2011) were followed in the GO-OUT outdoor walking sessions to contribute to fidelity of treatment delivery (the overall median number (IQR) of components performed per session, attendance rates in all research sites, and progressiveness of the protocol). Analyzing the study protocol, the results from the pilot study (Barclay et al., 2018), and the safety guidelines developed by the principal investigators, we concluded that the outdoor walking sessions were carefully planned by the principal investigators, which supported fidelity of study design. Even though some aspects of fidelity of provider training could have been done differently, the principal investigators still followed important recommendations from the literature (Bellg et al., 2004; Borrelli, 2011). In addition, one of the measurement tools used to measure fidelity of provider training (the reflective notes) may have motivated the walking leaders to share only the struggles and the challenges that they faced during the intervention. But as the principal investigator in Toronto observed in the walking session in week 7, and the principal investigator from Winnipeg observed in many sessions in the pilot, walking leaders did many things right. Therefore, even though some drifts from the protocol could have been avoided, all the strategies used to maintain a high degree of fidelity of the GO-OUT outdoor walking sessions should be acknowledged. Finally, since it was not the intention of this evaluation to measure the other components of fidelity (treatment receipt and enactment), we cannot make conclusions on the overall degree of fidelity of the intervention. Future studies should consider analyzing all five components of treatment fidelity so that more comprehensive conclusions about internal and external validity can be made.

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