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Perceived and objective entrance-related environmental barriers and daily out-of-home mobility in community-dwelling older people

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ABSTRACT

Purpose: We studied whether entrance-related environmental barriers, perceived and objectively recorded, were associated with moving out-of-home daily in older people with and without limitations in lower extremity performance.
Methods: Cross-sectional analyses of the "Life-space mobility in old age" cohort including 848 community-dwelling 75–90-year-old of central Finland. Participants reported their frequency of moving out-of-home (daily vs. 0–6 times/week) and perceived entrance-related environmental barriers (yes/no). Lower extremity performance was assessed (Short Physical Performance Battery) and categorized as poorer (score 0–9) or good (score 10–12). Environmental barriers at entrances and in exterior surroundings were objectively registered (Housing Enabler screening tool) and divided into tertiles. Logistic regression analyses were adjusted for age, sex, number of chronic diseases, cognitive function, month of assessment, type of neighborhood, and years lived in the current home.
Results: At home entrances a median of 6 and in the exterior surroundings 5 environmental barriers were objectively recorded, and 20% of the participants perceived entrance-related barriers. The odds for moving out-of-home less than daily increased when participants perceived entrance-related barrier(s) or when they lived in homes with higher numbers of objectively recorded environmental barriers at entrances. Participants with limitations in lower extremity performance were more susceptible to these environmental barriers. Objectively recorded environmental barriers in the exterior surroundings did not compromise out-of-home mobility.
Conclusion: Entrance-related environmental barriers may hinder community-dwelling older people to move out-of-home daily especially when their functional capacity is compromised. Potentially, reducing entrance-related barriers may help to prevent confinement to the home.

1. Introduction

Declining health and functional capacity increase the risk of physical inactivity in old age, which in turn leads to further health decline (Rantanen et al., 1999). Physical activity tends to increase when an individual leaves the home (Davis et al., 2011; Portegijs, Tsai, Rantanen, & Rantakokko, 2015) In addition, leaving the home daily is associated with better health and function in community-dwelling older people (Shimada et al., 2010; Fujita, Fujiwara, Chaves, Motohashi, & Shinkai, 2006), and enables older people to participate in meaningful activities (Satariano et al., 2012; Baker, Bodner, Allman &, 2003). Consequently, low frequencies of moving out-of-home may threaten independence and quality of life of community-dwelling older people (Satariano et al., 2012; Simonsick, Guralnik, Volpato, Balfour, & Fried, 2005; Iwarsson & Isacsson, 1998). In addition to personal factors, environmental factors have been associated with community mobility of an individual (Rantakokko, Iwarsson, Portegijs, Viljanen, & Rantanen, 2015; Yang & Sanford, 2012). The neighborhood environment may motivate people to leave home and be physically active (e.g. parks or services), while it may also pose barriers for mobility (e.g. poor road conditions or long distances) (Ward Thompson, 2013; Rantakokko, Portegijs, Viljanen, Iwarsson, & Rantanen, 2016). However, relationships between features of the neighborhood

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environment and physical activity and walking behavior are inconsistent for older people (Van Cauwenberg, De Bourdeaudhuij, & De Meester, 2011). Entrance-related environmental barriers, which are located at the home entrance or in the close exterior surroundings, are the first obstacles an individual may encounter in the physical environment when leaving the home. While hitherto not investigated, these entrance-related environmental barriers may reduce the frequency of out-of-home mobility.

According to the ecological theory of aging and the notion of person-environment fit (Lawton & Nahemow, 1973), an individual's behavior depends on personal factors (e.g. lower extremity performance) and environmental factors (e.g. obstacles in the natural and built environment). Barriers in the built environment may be professionally assessed either objectively through direct observation against preset criteria or by using self-rating to capture older people's perceptions of such barriers. Objectively assessed barriers may not impede mobility for everyone, as mobility is largely dependent on the functional capacity of the individual (Benzinger et al., 2014; Iwarsson, Horstmann, Carlsson, Oswald, & Wahl, 2009). Perceptions of environmental barriers, on the other hand, take into account personal and environmental factors as well as the desired activities of an individual (Lawton & Nahemow, 1973; Rantakokko et al., 2010). Thus, such perceptions may be more closely related to the actual behavior, e.g. out-of-home mobility, of an individual. However, people with functional limitations may not be exposed to physical environmental barriers due to activity restriction (Lord, Menz, & Sherrington, 2006; Portegijs et al., 2013) and consequently remain unaware of the accessibility problems related to a suboptimal person-environment fit. Alternatively, according to the model of selective optimization and compensation (Baltes & Baltes, 1990), individuals with functional limitations may find ways to cope with physical environmental barriers (e.g. poor lighting in a familiar environment) or effectively compensate for them (e.g. installation of handrails at entrance stairs) to maintain their activity.

Guidelines and policy for environmental planning and construction commonly target objective aspects of the environment (Yen, Michael, & Perdue, 2009). Accordingly, it is important to increase the understanding of relationships between objective and perceived environmental barriers in and around the home and how such barriers and relationships affect mobility behavior of older people with and without functional limitations. Especially in older populations, the relationship between objective and perceived environmental barriers is not clear (Gebel, Bauman, & Owen, 2009; Byles et al., 2014; Carter, Campbell, Sanson-Fisher, Redman, & Gillespie, 1997). Yet, objective and perceived aspects of housing are associated with different health outcomes, in particular activities of daily living (Byles et al., 2014; Oswald et al., 2007; Wahl, Fange, Oswald, Gitlin, & Iwarsson, 2009; Iwarsson, Horstmann, & Slaug, 2007) and falls (Iwarsson et al., 2009; Oswald et al., 2007; Wahl et al., 2009). In addition, previous studies have demonstrated associations between housing aspects and physical activity (Benzinger et al., 2014) as well as the frequency and difficulty of participation in community activities among older people (Yang & Sanford, 2012). To the best of our knowledge there is a paucity of research studying relationships between housing aspects and out-of-home mobility in old age.

The aims of the current study were to explore 1) the association between objectively recorded and perceived entrance-related environmental barriers for mobility at home entrances and in the close exterior surroundings among community-dwelling older people with and without lower extremity performance limitations, and 2) whether objectively recorded and perceived environmental barriers were associated with moving out-of-home on a daily basis among community-dwelling older people with and without lower extremity performance limitations. Objective environmental barriers for mobility at home entrances and in the close exterior surroundings were studied separately, while perceived entrance-related barriers scale included items of both dimensions.

2. Materials and methods

2.1. Study design and recruitment

This study was based on cross-sectional analyses of baseline data of the "Life-space mobility in old age" (LISPE) cohort study in community-dwelling, 75–90-years-old people, living in the municipalities of Muurame and Jyväskylä in central Finland. The study methods, including non-respondent analyses, have been published previously (Rantanen et al., 2012). In summary, a random sample of 2550 people was informed with a letter about the study. Willingness and eligibility for participation (living independently, able to communicate, and residing in the recruitment area) were determined during a phone interview. At the home visits for the baseline data collection, participants also signed an informed consent form (N = 848). The LISPE study was approved by the Ethical Committee of the University of Jyväskylä, Finland.

2.2. Main instruments

Moving out-of-home daily (yes vs. less often), i.e. an indicator of out-of-home mobility, was assessed using a self-report question of how many days a week a participant moved outside his/her home during the preceding four weeks (according to the life-space assessment (Baker et al., 2003)). Participants reporting to move in their neighborhood, town or beyond were also considered to have moved outside their home.

Lower extremity performance, i.e. an indicator of functional capacity, was objectively assessed by the Short Physical Performance Battery, comprising of three tests that assess standing balance, walking speed over 2.44 m, and five timed chair rises. Each task was rated according to established age- and gender-specific cut-off points, and a sum score (range 0–12) was calculated (Guralnik et al., 1994; Mänty, Sihvonen, Hulkko, & Lounamaa, 2007). Higher scores indicate better performance. In order to stratify the sample for the analyses, participants were categorized according to a dichotomization based on the median of lower extremity performance (short physical performance score 10).

Two sections of the Housing Enabler Screening Tool were used to objectively assess **environmental barriers** at the entrance and in the exterior surroundings of the home (Iwarsson, Slaug, & Malmgren Fänge, 2011). The Housing Enabler is based on current national standards and guidelines for good housing design (Iwarsson, Slaug, & Haak, 2012). The screening tool contained 17 items **on close exterior surroundings** (passenger loading zone far, narrow path, irregular surface, unstable surface, steep gradients, routes with steps, no/insufficient cues of level changes/hazards, high curbs, curbs with abrupt sides, no handrails on steep gradients, no/too few resting places on slopes, poor lighting, no/too few seating places, steps/level changes to refuse bin, steps/level changes to mailbox, refuse bin difficult to reach, and mailbox difficult to reach) and 11 items **on entrances** (narrow door openings, thresholds/steps at entrance, insufficient maneuvering space at doors, no resting area in front of entrance door, heavy doors, door that close quickly, complicated/illogical opening procedure, stairs the only route, high/low/irregular heights of risers, no/one-sided handrail, and handrails too short). During the home visit, trained assessors evaluated the home entrance and the exterior surroundings of the home using the screening tool rating each environmental barrier as present/not present. For each environmental barrier section, the total number of barriers