



# LUND UNIVERSITY

## Mobility and mobility-related participation outcomes of powered wheelchair and scooter interventions after 4-months and 1-year use.

Löfqvist, Charlotte; Petterson, Cecilia; Iwarsson, Susanne; Brandt, Åse

*Published in:*

Disability and rehabilitation. Assistive technology

*DOI:*

[10.3109/17483107.2011.619224](https://doi.org/10.3109/17483107.2011.619224)

2012

[Link to publication](#)

*Citation for published version (APA):*

Löfqvist, C., Petterson, C., Iwarsson, S., & Brandt, Å. (2012). Mobility and mobility-related participation outcomes of powered wheelchair and scooter interventions after 4-months and 1-year use. *Disability and rehabilitation. Assistive technology*, 7(3), 211-218. <https://doi.org/10.3109/17483107.2011.619224>

*Total number of authors:*

4

### General rights

Unless other specific re-use rights are stated the following general rights apply:

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

Read more about Creative commons licenses: <https://creativecommons.org/licenses/>

### Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

LUND UNIVERSITY

PO Box 117  
221 00 Lund  
+46 46-222 00 00

**Mobility and mobility-related participation outcomes of powered wheelchair and scooter interventions after four months and one year use**

## **Abstract**

**Purpose.** The aim was to investigate outcomes of powered wheelchair and scooter interventions after four months and one year use regarding need for assistance when moving around, frequency of mobility-related participation, easiness/difficulty in mobility during participation, and number of participation aspects performed in everyday life.

**Method.** The study was a prospective cohort study, using an instrument focusing on mobility-related participation outcomes of mobility device interventions; (NOMO 1.0), at baseline, after four months and one year use.

**Results.** The results show that the outcomes in terms of participation frequency and easiness in mobility occur in a short time perspective, and that the effects remained stable at one-year follow-up. The frequency of going for a walk increased most prominently (26%). Even though the majority of the participation aspects were not performed more often they became easier to perform: 56-91% found that shopping, walking and visiting family/friends were easier,. Moreover, independence outdoors and indoors increased.

**Conclusion.** This small study provides knowledge about the outcomes of powered wheelchairs and scooters in terms of mobility and mobility-related participation in real-life situations. The study supports results from former studies, but even so, larger studies are required in order to provide evidence for the effectiveness of powered wheelchairs and scooters.

## **Introduction**

Powered wheelchairs (PWC) and powered scooters (PS) are mobility devices (MD), that aim at improving mobility, activities, and participation for persons with mobility limitations. Provision of MD is generally considered to be an intervention of great importance, and the United Nations (1) as well as the World Health Organisation (2) recommend assistive technology interventions, such as MD, as an important tool for creating equal opportunities for people with disabilities; to increase the independence in daily life and to facilitate inclusion and participation (3,4). The importance of and need for outcomes research of assistive technology (AT) such as PWC/PS is stressed (5, 6). Research on effects of PWC and PS interventions in terms of activities and participation is, however, limited.

Only two studies on outcomes of PWC and PS interventions were identified in a systematic review from 2009 (7). Hoenig et al investigated effects of PS interventions for persons with osteoarthritis or rheumatoid arthritis by means of a randomised controlled study, using no intervention as control (8). Using a study specific questionnaire they found no difference in the number of places visited, but there was a clear increase in PS use, particularly when going to food shops or the doctor. In the other study, Pettersson et al. investigated participation outcomes of PWC interventions for older people suffering from stroke by means of a cohort study, using the Individually Prioritised Problem Assessment (IPPA) (9) and the World Health Organization Disability Assessment Schedule (WHO-DAS II) (10) as outcome

measurement instruments. The study showed that nearly all participants' activity-related problems decreased, and that their independence in self-care, domestic life, interpersonal interactions and relationships, participation in community, social and civic life, and ability to get around increased (11). In 2010, Auger et al. (2010) found that life space increased in relation to PWC interventions, i.e. it was found that the participants went outdoors more often, even though still mostly around the home and neighbourhood. In addition, a few cross-sectional studies have been carried out, all showing positive results after a PWC or PS intervention (12-15). It can be summarized that high quality research concerning outcomes of PWC and PS intervention among community-living persons is scarce, and that more research is required.

A considerable number of PWC and PS are taken into use every year, and since each device costs from about €200 – 2000, PWC and PS intervention also implies substantial societal costs. According to available information, during 2005, 28 PWC/PS per 10 000 inhabitants were delivered in Sweden (16). A Danish study based on 33 municipalities showed that the number of delivered PS had doubled from 2002 to 2006 and that the number of delivered PWC also had increased. It was estimated that 32.8 PS and 9.2 PWC per 10 000 inhabitants had been delivered in 2006 (17). The most recent Finnish study showed that an average of 6.7 PWC/PS per 10 000 inhabitants was delivered in 2001 (18). According to the Norwegian national register, 22.9 PS and 31.3 PWC per 10 000 inhabitants were delivered in 2009 (19).

In the Nordic countries, AT interventions are mainly publicly financed. To persons with severe difficulty or inability to walk due to functional limitations, devices such as PWC and PS are to some extent granted for free, aiming at enhancing independence, activity and participation. The decision on an AT intervention is based on individual needs assessment (20-23). Criteria for granting PWC or PS are that the devices should increase independence in everyday life significantly, and that the person must be able to drive the PWC or PS independently and safely. For this purpose cognitive as well as practical skills are being tested by driving in the actual environment. Knowledge about outcomes of PWC/PS interventions is part of the clinical reasoning process of the therapist involved in the intervention, and knowledge about effects of PWC/PS regarding activity and participation is therefore of utmost importance.

The purpose of this explorative study was to investigate the outcomes of PWC and PS interventions over time, as part of the MD solution for persons with mobility limitations regarding:

- Extent of assistance from another person when moving around in different real life environments.
- Engagement in different kinds of everyday participation aspects; participation frequency; easiness/difficulty in mobility during participation; and number of participations aspects performed in everyday life.

## **Methods and materials**

### *Study context*

This study is part of a comprehensive cross-Nordic project, running 2009-2013, aiming at providing national and Nordic comparative knowledge about outcomes of PWC and PS to be used for both research and clinical developmental purposes. In all about 250 adults who receive a PWC or PS for the first time will be followed during one year. They are interviewed about mobility and mobility-related participation, i.e. participation involving mobility by means of ‘The Nordic mobility-related participation outcome evaluation of assistive device interventions’ (NOMO 1.0), an instrument focusing on mobility-related participation outcomes of MD interventions. They are also asked about their quality of life, satisfaction with their PWC or PS, and the delivered service. Besides, each service delivery process is documented. The aim for the comprehensive cross-Nordic project is also to perform further psychometric testing of the NOMO 1.0. The present study is based on the first Swedish data on mobility and mobility-related participation outcomes of PWC and PS collected by means of the NOMO 1.0.

### *Study design*

The study was a prospective cohort study with data collection by means of structured interviews at baseline, 4-months, and at 1-year follow-up.

### *Study district and sample*

The study district included five municipalities in the south of Sweden. Inclusion criteria were:

- Persons, 20 years of age or more, living in private housing and not in any acute rehabilitation phase.
- Persons granted a PWC or PS for the first time for indoor and/or outdoor use, with the purpose to increase the person's mobility and participation.
- Persons with cognitive capacity and verbal skills sufficient for participation in personal interviews.

All eligible study participants during 2008 were enrolled consecutively. The participants were asked to participate by the therapist in connection with the selection and testing of a PWC/PS. Written informed consent was given before the interviews. Out of 48 person asked, 47 persons agreed to participate and were interviewed at baseline. For the first follow-up interview four months later, it was possible to interview 42 of them. Reasons for the dropout (three men and two women) were: not able to reach (n=1), death (n=1), return of the device (n=3). One year after baseline the study sample consisted of 34 persons, (n=27 PS users; n=7 PWC users). Reasons for dropouts (seven men and one woman) were: return of the device (n=2), death (n=1) and deteriorated health (n=5). Drop-out analyses showed that there were no significant differences between participants dropping out and the final study sample with respect to age, gender, number of functional limitations, and general health. The participants were 23 men and 11 women (mean age = 69 years); half of them single-living. The majority of the participants were living in urban or semi urban areas (n=27). The participants all had additional MD, and the combinations of MD in use at baseline and over time are presented in table 1. At one year follow-up two persons reported changes in the home



environment (removed thresholds and installation of a ramp). At baseline, 85% reported that their dwelling was designed according to their mobility capacity. Seventy-six per cent (n=26) were able to take at least one step without personal assistance. No changes were reported concerning living situation, but the number of functional limitations increased over time (mean number at baseline was 4.9 and 5.9 one year later). Further sample characteristics are presented in table 2.

Insert table 1 and 2 about here

#### *The NOMO instrument*

The NOMO 1.0 was developed in a Nordic context in order to document outcomes of MD interventions (24). The instrument focuses on outcomes concerning independence in mobility in different environments and mobility-related participation such as shopping, visiting friends/family or going to a restaurant. The basic psychometric properties of the instrument have been tested showing good content validity, internal consistency, and test-retest reliability (24). The instrument is available in four Nordic languages. It has a structured format and a manual and is administered by means of personal interviews. It consists of a baseline interview to be administered just before the person receives a new MD or has a device replaced with another type, and a follow-up interview to be accomplished after the user has used the device for at least four months. Participation aspects were defined based on International Classification of

Functioning, Disability and Health (ICF) (25) and focus on the actual performance of mobility and mobility-related participation in the everyday environment. The objective of the instrument is to assess outcomes of the total MD solution (not the single MD), and for this study, the outcome of supplementing the users device solutions with PWC and PS is in focus.

The NOMO 1.0 consists of

1. Four items about dependence in mobility within four different environments (indoors in the home, in and out from the home, indoors in other places and outdoors in general):
  - *Extent of assistance in mobility* scale offering response options on a 4-graded ordinal scale ranging from 'no assistance' to 'very much assistance'.
2. Twenty-two items about mobility-related participation:
  - *Frequency of mobility-related participation* scale offering response options on a 9-graded scale going from 'at least once a day' to 'never'.
  - *Easiness/difficulty in mobility during participation* scale offering response options on a 5-graded ordinal scale ranging from 'very easy' to 'very difficult'. The alternative 'don't know' was also possible.
  - *Mobility-related participation repertoire index*, i.e. a sum of the number of participation aspects performed, based on the responses of the 'Frequency of mobility-related participation scale'.

In addition, the instrument includes a number of descriptive items about MD use, housing, functional limitations, health, etc. At baseline, one open-ended question about expectations to the PWC/PS concerning participation was asked. At follow-up two structured questions were asked about fulfillment of expectations, followed by an open-ended question about what participation aspects the MD actually had been used for.

### *Procedure*

The participants were interviewed at baseline by means of the NOMO 1.0 (24) just after they had been granted a PWC or PS but had not yet received it. Two follow-up interviews followed: after 4-4.5 months use and when the MD had been in use for at least one year (12-15 months). The majority of the baseline interviews were performed during spring and summer time (n=24), while the remaining ten were performed in the autumn. Two experienced occupational therapists carried out the interviews, one of whom was involved in the provision process for ten of the participants. At baseline 18 of the interviews were performed at a health center, 14 in the respondents' homes, and two at other locations. The two follow-up interviews were in 95 % of the cases performed in the respondents' homes.

### **Analysis**

Drop-out analysis was performed (n=13 compared to the final sample n=34) regarding age, gender, number of functional limitations and overall health. The sign test was used for analyzing changes over time in terms of dependence in mobility, frequency of mobility-related participation aspects and easiness/difficulty in mobility during

participation. In addition, changes in easiness/difficulty over time were divided into three groups: participation became easier, unchanged, or more difficult, respectively. Since the frequency of 'does not know' responses concerning easiness/difficulty was low (n=5), these responses were excluded. In these analyses, due to the high number of statistical tests performed, Bonferroni corrections were made (25), considering p-values <0.05 to be significant. The paired t-test was used to analyse the mobility-related participation repertoire index. Descriptive statistics were used to describe statements of expectations. Outcomes given as responses to the open-ended questions were categorized and utilized for illustrative purposes in the presentation of the results.

### **Ethical issues**

All principles in ethical guidelines for human research and Swedish national legislation were followed meticulously. In addition, approval of the Ethical Board within the Education organization of the Faculty of Medicine was achieved.

### **Results**

#### *Extent of assistance in mobility*

In the 4-month perspective, the need for assistance in mobility from other persons decreased significantly when moving around in general outdoor environments ( $p < 0.0001$ ): approximately 50% became more independent, and indoors at other places than in the home ( $p = 0.031$ ) about 30% became more independent. In the 1-year perspective, these changes remained stable. No differences in the extent of assistance

were seen as regards mobility indoors in the home or getting in and out of the home, neither at the 4-month perspective nor the 1-year perspective.

*Frequency of mobility-related participation and easiness/difficulty in mobility*

In the 4-month perspective, the frequency of how often the participants went for a walk/ride, performed shopping, visited restaurant and culture or sport events increased non-significantly by 12-26%, while not statistically significant (table 3). The results remained stable over the year. Turning to easiness/difficulty in mobility-related participation, half of the participation aspects were rated as significantly easier to perform after the PWC/PS had been in use for four months (table 3). That is, mobility while shopping, going for a walk, visiting friends, or the pharmacy, was experienced as significantly easier ( $p < 0.0001-0.002$ ). No other or additional changes were seen at the one year follow-up.

Insert table 3 about here

*Mobility-related participation repertoire*

The number of participation aspects that the participants engaged in did not increase significantly over time. At baseline the mean number of participation aspects were 8.3 out of 22 SD 3.9.; four months later it was 8.7 SD 3.1.; and at the 1-year follow-up 8.7 SD 2.9.

### *Expectations and fulfillments*

At baseline, as response to the open-ended question about expectations to the PWC/PS the majority of the participants stated that they wished to use the granted PWC/PS for getting out-doors, into the nature and the city-centre; i.e. to be able to go to the church yard or a concert as well as to visit the sea-side or the forest. They also expressed that they wished to visit family and friends, and to socialize in for example, a café or the library. Half of the participants also said that they expected that the PWC/PS would make it possible for them to do the everyday shopping. At the 4-month follow-up, the majority stated that they did use the PWC/PS to socialize and perform everyday shopping. At the 1-year follow-up, the participants reported involvement in the same types of participation aspects; they still went our-doors, into the city-center and the nature, even though fewer persons performed each participation aspect by that time.

Approximately 80% had their expectations of the PWC/PS fulfilled and judged the device to be much better or better than expected, according to the structured question. The participants to a great extent did what they had intended to do with the PWC/PS, and an increase in independence was expressed..

### **Discussion**

Summing up on the results, this study provides some of the first user-based information about the outcomes of PWC/PS in terms of mobility and mobility-related participation in real-life situations, based on a small Swedish sample. The results indicate that participation frequency increases for some aspects of participation after a PWC/PS

intervention, while some become easier. The study also shows that the outcomes occur in a short time perspective and remain relatively stable in a one-year perspective. In addition, the results show that the device clearly increases independence in mobility outdoors and indoors in other places than the home. PWC and PS interventions thus seem to enhance mobility-related participation in everyday life.

Shopping, going for a walk and social and family events were the participation aspects that were most prominently influenced by a PWC/PS intervention. In terms of significance, without the Bonferroni correction, frequencies of shopping and going for a walk were found to be significant. As for how easy the participation aspects were performed, besides going for a walk, shopping and visiting family/friends, kitchen work, visiting restaurant, hairdresser, bank and gardening had turned out to be significantly easier to perform. We have, however, for this small sample chosen a more rigorous approach for the interpretation of the results. Further and more comprehensive studies are needed in order to increase this kind of knowledge.

The fact that in our study PWC/PS facilitated independence and made it possible to maintain important participation aspects such as shopping, socializing and 'going' for a walk has also been found in other pre-post design studies (11, 15). These social participation aspects are important for health and quality of life, in particular in old age (27). That is, to be able to shop, go for a walk or on an excursion can have great implications for wellbeing as well as independence, and also presumably for ones role in the family situation, not to mention the importance for the health in itself to be able

to go outdoors (28-30). Aspects such as independence in mobility, the possibility to remain life-roles etc, can be assumed to impact on life satisfaction and quality of life which imply that also these aspects should be assessed when studying the outcome of PWS/PS.

The PWC/PS intervention did not, however, result in other or additional participation aspects or changes in the participants repertoire of participation aspects. One explanation may be that that people's life habits and routines tend to stay stable (28) and may possibly reflect the habits of this group rather than lack of outcome of the device. This is also partly supported by a study by Auger et al exploring life-space mobility after PS intervention (31), which also found stability in going to specific locations, mostly around the home and in the neighborhood.

The results also revealed that not all participation aspects were maintained over the year and that some remained unchanged or became more difficult to engage in for some participants, for example going to the pharmacy and post office. One reason could be that the participants received the PWC/PS when the progress of disability and deteriorate health already was prominent and worsened over time. It could also, of course, be due to the ageing process as such, since the mean age of the participants was 69 years, already living/coping with a combination of functional limitations increasing over the study period. Moreover, environmental barriers in the outdoor environment such as kerbs most likely add to increased difficulty in participation as found in other studies (12, 32, 33). This is also supported theoretically by the ecological model of



aging by Lawton (34), in which the person is seen as a set of competencies and the environment constitute the environmental press. As a person's competencies decline and adaptation capacity decrease, in general as people age, higher vulnerability to the environmental demands arises.

It was not expected that mobility when performing participation aspects in the indoor environment would be improved, because most PWS/PS were granted for outdoor use. Still, some changes were seen as regards the easiness of mobility indoors. Since significantly less pain in relation to mobility was reported at the 4-month follow-up, it could be that facilitating outdoor mobility impacted on the possibilities to perform other everyday activities such as domestic work. This un-expected outcome on participation aspects in the indoor environment, might therefore be of importance to study further to fully understand the effects of the intervention.

Very few housing adaptations or other changes were made in the participants' homes during the study period and the need for assistance when moving in and out of the home did not decrease. That is, presumably environmental barriers existed in terms of stairs and narrow doors, in and in close connection to the home. While studying such aspects goes beyond the scope of the current study, for optimal effect of this kind of MD one could argue that also other changes in the environment in order to facilitate mobility would be beneficial. Another reason for still having need for assistance when going in and out of home could be the need for help when fetching or transferring to the PWS/PS, or for other practical issues, such as putting on outdoor clothes. That is, there

are many challenges to overcome in order to get outdoors, which has to be considered when providing a PWC/PS.

The users' intention to use the PWC/PS is known to have an impact on how and how far away from home the device is being used (31). In our study PWC/PS were used for a variety of participation aspects, most of them in congruence with the user's prior expectations. Even if the result of our open question illustrate that this kind of MD makes a difference in the life of a person with mobility limitations, there is a need to further explore the outcome on PWC/PS in order to grasp to which extent the device assists the users. The overall outcome constitute a result from the interaction between the specific device, also in relation to other MD in use, its user, the participation aspect carried out, and the environment - which is not yet clearly described, understood or evaluated (35).

The study results should, however, be seen in the light of some study limitations. For this first study using the NOMO 1.0 a small sample was used implying reduced possibilities for confounder control and causal analysis. Moreover, there are differences in use between PWC and PS presumably effecting e.g. in- and outdoor use, but due to the small sample size, subgroups analyses were not feasible. Only few women took part in this study, which presumably impact on the results, since men are known to be more active in the use of PWC/PS outdoors and the two genders engage in different participation aspects (12). Also urban living relates to higher use of MD by older adults (36), and age and gender impact on the mobility-related participation repertoire, for

example how often and where one does the shopping. That is, the study cannot be considered as representative for the study population, hampering the generalizability of our results. In addition, the study was performed in south Sweden where weather conditions are less severe concerning ice and snow compared to e.g. Norway and north Sweden and Finland. Icy weather conditions could have impacted on outcomes at 4-months follow-up if baseline data had been collected in August and follow-up in December. Hence there is a need to further examine the effect of PWC/PS in larger studies, PWC and PS as separate MD, in different age groups and from a gender perspective.

Another limitation may seem to be the study design as no control group was used to reduce bias. This was not, however, possible for ethical and legal reasons, since in Sweden people in need for have a legal right to receive at PWC or PS. In such situations a cohort study design following outcomes over time is robust and is in reality the only possible study design (7).

Even though the NOMO 1.0 instrument did identify changes over time, the instrument is still under development and further studies on psychometric properties of the instrument are needed, e.g. responsiveness and ceiling/floor effects (24).

## **Conclusions**

The overall conclusion regarding outcomes of PWC/ PS interventions after four and 12 months is that changes in the participation frequency and easiness in mobility-related participation seem to occur in a short time perspective and stay relatively stable over time. In turn this implicates that the 4-month follow-up time after PWC/PS intervention is adequate in areas with stable weather conditions. Going for a walk, shopping, visiting restaurants and culture or sport events were the participation aspects that most prominently increased after a PWC or PS intervention regarding frequency and going for a walk, shopping and visiting family or friends regarding easiness. Even though the results indicate that the PWC/PS only lead to increased participation frequency for some of the participation aspects, participation aspects became, to a great extent, easier after the intervention in spite of the fact that the number of functional limitations increased during the one year study. Easiness in participation can therefore be considered as an important outcome dimension of PWC/PS interventions. In addition, the device clearly increased independence in mobility, i.e. a prerequisite for mobility-related participation. The study is, however, small with a non-representative sample, and larger studies are required in order to provide evidence for outcomes of PWC/PS. Even so, the study has generated more knowledge about outcomes from PWC/PS, an area of research that is deficient, and this information so far can to a certain extent assist policy makers, services providers and users on service delivery criteria and the timing for follow-up after PWC/PS interventions.

### **Implications for rehabilitation**

- Powered wheelchair and scooter interventions increased independence in mobility and easiness in mobility-related participation in everyday life.
- Easiness in participation can be considered an important follow-up dimension after powered wheelchair and scooter interventions.
- A 4-month follow-up time after powered wheelchair and scooter intervention seems adequate.

### **Acknowledgements**

This study was supported by funding from the Ribbing Foundation, Lund Sweden and the Swedish Research Council on Social Science and Working Life and accomplished in the context of the Centre of Ageing and Supportive Environments (CASE), Lund University.

### **Declaration of interest**

The authors report no declarations of interest.

### **References**

- [1] United Nations. Standard rules on the equalization of opportunities for persons with disabilities. New York United Nations Department of Public Information; 1994.

- [2] World Health Organization [WHO]. Disability and Rehabilitation Action plan 2006-2011. [cited 2006 Aug 18]; Available from <http://www.who.int/disabilities/>
- [3] Nordic Cooperation on Disability. Provision of assistive technology in the Nordic countries. 2 ed. Vällingby: Sweden; Nordic cooperation on disability; 2007.
- [4] World Health Organization [WHO]. Guidelines on the provision of wheelchairs in less resourced settings 2008 [cited 2011Jan]; Available from: <http://www.who.int/disabilities/publications/technology/wheelchairguidelines/en/index.html>
- [5] Fuhrer MJ. Assessing the efficacy, effectiveness, and cost-effectiveness of assistive technology interventions for enhancing mobility. *Disabil Rehabil Assist Technol* 2007;2:149-58.
- [6] Auger C, Demers L, Gélinas I, Jutai J, Fuhrer M, DeRuyter F. Powered mobility for middle-aged and older adults: systematic review of outcomes and appraisal of published evidence. *Am J Phys Med Rehabil* 2008;87:666-80.
- [7] Salminen AL, Brandt A, Samuelsson K, Toytari O, Malmivaara A. Mobility devices to promote activity and participation: a systematic review. *J Rehabil Med* 2009 Sep;41:697-706.
- [8] Hoenig H, Giacobbi P, Levy CE. Methodological challenges confronting researchers of wheeled mobility aids and other assistive technologies. *Disabil Rehabil Assist Technol* 2007;2:159-68.
- [9] Wessels RD, de Witte L, Andrich R, Ferrario M, Persson J, Oberg B. IPPA, a usercentred approach to assess effectiveness of assistive technology provision. *Technol Disabil* 2000;13:105-15.

- [10] World Health Organization [WHO]. WHODAS II. [cited 2006 Sept 12]  
Available from: <http://www.who.int/icidh/whodas/index.html>
- [11] Pettersson I, Ahlström G, Tornquist K. The value of an outdoor powered wheelchair with regard to the quality of life of persons with stroke: a follow-up study. *Assist Technol* 2007;19:143-53.
- [12] Brandt Å, Iwarsson S, Ståhl A. Older peoples use of powered wheelchairs for activity and participation. *J Rehabil Med* 2004;36:70-7.
- [13] Pettersson I, Appelros P, Ahlström G. Lifeworld perspectives utilizing assistive devices: Individuals, lived experience following a stroke. *Can J Occup Ther* 2006 Feb;74:15-26.
- [14] Davies A, De Souza LH, Frank AO. Changes in the quality of life in severely disabled people following provision of powered indoor/outdoor chairs. *Disabil Rehabil* 2003;25:286-90.
- [15] Rousseau-Harrison K, Rochette A, Routhier F, Dessureault D, Thibault F, Cote O. Impact of wheelchair acquisition on social participation. *Disabil Rehabil Assist Technol* 2009;4:344-52.
- [16] Hjälpmedelsinstitutet. Äldrestatistik 2010. Äldres hälsa, funktionsnedsättning, boende och hjälpmedel [Statistics on old people 2010. Elderlies health, disability, living and assistive devices]. Vällingby: Hjälpmedelsinstitutet; 2010.
- [17] Brandt Å, Stapelfeldt C. Forbrug af mobilitetshjælpemidler 2002-2006 - på basis af data fra Zealand Care [Use of mobility devices 2002-2006 – based on data from Zealand care]. Århus: Hjälpemiddelinstittet; 2009.

- [18] Kolomainen U. Sähköisten liikkumisapuvälineiden myöntämiskäytännöt sairaanhoitopiireissa [Provision practices of powered mobility devices in Finnish hospital districts]. Jyväskylä: University of Jyväskylä; 2003.
- [19] Norwegian Labour and Welfare service. Statistics produced by the department of assistive technology NAV. Available from: NAV Oslo: Norway; 2010.
- [20] European Commission [EU]. Access to assistive technology in the European Union. 2003 [cited 2004 Sept]; European Commission, social security and social integration;  
Available from:  
[http://ec.europa.eu/employment\\_social/disability/assistive\\_technology\\_study\\_en.pdf](http://ec.europa.eu/employment_social/disability/assistive_technology_study_en.pdf)
- [21] Nordic Centre for Rehabilitation Technology N. Provision of assistive technology in the Nordic countries. Helsinki; 2007.
- [22] Houben PPJ. Changing housing for elderly people and co-ordination issues in Europe. *Housing Studies*. 2001;16:651-73.
- [23] Hvinden B. Nordic disability policies in a changing Europe: Is there still a distinct model? *Soc Poli Admin* 2004;38:179-89.
- [24] Brandt Å, Löfqvist C, Jónsdóttir I, Sund T, Salminen A-L, Werngren-Elgström M, Iwarsson, S. Towards an instrument targeting mobility-related participation: Nordic cross-national reliability. *J Rehabil Med* 2008;40:766-72.
- [25] Kazdin AE. *Research Design in Clinical Psychology*, Fourth Ed. Boston: Allyn & Bacon; 2003.
- [26] World Health Organization [WHO]. *International classification of functioning, disability and health (ICF)*. Geneva: WHO; 2001.



- [27] Lövdén M, Ghisletta P, Lindenberger U. Social participation attenuates decline in perceptual speed in old and very old age. *Psycho Aging* 2005;20:423-34.
- [28] Kielhofner G. *Model of Human Occupation: Theory and application*. Fourth ed. Lippincott: Williams & Wilkins; 2008.
- [29] Mollenkopf H, Baas S, Marcellini F, Oswald F, Ruoppila I, Szeman Z, et al., editors. *A new concept of out-of-home mobility*. Amsterdam: IOS Press; 2005.
- [30] Simonsick EM, Guralnik JM, Volpato S, Balfour J, Fried LP. Just get out the door! Importance of walking outside the home for maintaining mobility: findings from the women's health and aging study. *J Am Geriatr Soc* 2005;53:198-203.
- [31] Auger C, Demers L, Gelinas I, Miller WC, Jutai JW, Noreau L. Life-space mobility of middle-aged and older adults at various stages of usage of power mobility devices. *Arch Phys Med Rehabil* 2010;91:765-73.
- [32] Evans S, Frank AO, Neophytou C, de Souza L. Older adults' use of, and satisfaction with, electric powered indoor/outdoor wheelchairs. *Age Ageing* 2007;36:431-5.
- [33] Evans S, Neophytou C, de Souza L, Frank A. Young people's experiences using electric powered indoor - outdoor wheelchairs (EPIOCs): Potential for enhancing users' development? *Disabil Rehabil* 2007;29:1281-94.
- [34] Lawton MP. Competence, environmental press, and the adaptation of older people. In: Lawton MP, Windley PG, Byerts TO, editors. *Aging and environment: Theoretical approaches*. New York: Springer; 1982. p 33-59.

- [35] Wessels RD, Witte LP, Jedeloo S, van den Heuvel WP, van den Heuvel WJ. Effectiveness of provision of outdoor mobility services and devices in the Netherlands. *Clin Rehabil* 2004;18:371-8.
- [36] Agree EM, Freedman VA, Sengupta M. Factors influencing the use of mobility technology in community-based longterm care. *J Aging and Health* 2004;16:267-307.
- [37] Ware J, Snow K, Kosinski M, Gandek B. SF-36 health survey: manual and interpretation guide. Boston (Mass)7 The Health Institute,New England Medical Center; 1993.

Table 1. Combination of mobility devices in use at baseline, at 4-month and 1-year follow-up\*, n=34.

Mobility device	Baseline		4 months		1-year	
	Indoors	Outdoors	Indoors	Outdoors	Indoors	Outdoors
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Cane/crutches	13 (38,2)	19 (56)	14 (41)	15 (44)	9 (26)	16 (47)
Walker	2 (6)	1 (3)	0	0	2 (6)	0
Rollator	14 (41)	19 (56)	15 (44)	17 (50)	18 (53)	17 (50)
Manual wheelchair	4 (12)	8 (24)	5 (15)	7 (21)	8 (24)	12 (35)
Transportation wheelchair	1 (3)	4 (12)	1 (3)	2 (6)	0	0
Powered wheelchair						

	0	1 (3)	1 (3)	10 (29)	3 (9)	7 (21)
Powered scooter	0	0	0	24 (71)	4 (12)	27 (80)

---

\*It was possible to answer that one or more mobility device was in use.

Table 2. Description of the sample at baseline, at 4-months and 1-year follow-up, n=34.

	Baseline	4-months follow-up	<i>p</i> *	1-year follow-up	<i>p</i> <sup>§</sup>
Age years, M (SD)	69 (13,3)				
Age groups, n (%):					
> 80	5 (15)				
61-79	21 (62)				
< 60	8 (23)				
Gender, n (% women)	11 (32)				
Perceived health, md (q1,q3)	4 (3,4)	4 (3,4)	<i>ns</i>	4 (3,4)	<i>ns</i>
Physical mobility, md (q1,q3)	4 (4,5)	4 (3,4)	<i>ns</i>	4 (3,5)	<i>ns</i>
Pain vital for mobility, n (%)	23 (68)	10 (29)	<i>0.004</i>	17 (50)	<i>ns</i>
Stairs; possible to take at least one step,n (%)	26 (76)	24 (71)		22 (65)	

Number of FL, M (SD)	4.9 (1.9)	4.9 (2.0)	<i>ns</i>	5.9 (2.1)	<i>0.001</i>
Type of FL (n, %)					
-back and legs	30 (88)	31 (91)		32 (94)	
- tiredness	21 (62)	23 (68)		25 (73)	
- stamina/breath	24 (70)	23 (68)		26 (78)	
- balance/dizziness	21 (62)	20 (59)		29 (85)	
- arms	20 (59)	13 (38)		22 (65)	
- incontinence	12 (35)	10 (29)		13 (38)	
- vision	8 (24)	10 (29)		11 (32)	
- hearing	11 (32)	11 (32)		13 (38)	
- moving head	5 (15)	6 (18)		8 (24)	
- overall movements	6 (18)	5 (15)		8 (24)	
- memory	8 (24)	14 (31)		11 (32)	

---

FL=Functional limitations.

\*Difference between baseline and 4-month follow-up.

§Difference between 4-months follow-up and 1-year follow-up.

Health was self-rated by SF-36 (37), 5-grade scale from excellent (1) - poor (5).

Physical mobility was self-rated by use of en 5-grade scale from excellent (1) - poor (5).

Pain was self-rated on a categorical scale: no/yes/don't know.

Table 3. Changes in frequency of participation and in easiness/difficulty of mobility-related participation at baseline, 4-month and 1-year follow-up; the proportion of participants engaged in each participation aspect and the proportion of participants for whom easiness/difficulty changed over time, N=34.

Participation aspect	Changes in participation frequency between baseline, 4-month and 1-year follow up					Changes in easiness/difficulty between baseline and 4-month follow-up % <sup>d)</sup>			
	baseline	4- month	% Changes from baseline to 4- month	1-year <sup>b)</sup>		Easier	Un- changed	More difficult	p-value <sup>e)</sup>
			p-value <sup>a)</sup>	n <sup>c)</sup>					
Kitchen work	85	76	ns	68	24	50	29	21	ns
Washing up	44	38	ns	38	15	53	40	7	ns
Cleaning	44	41	ns	35	24	64	0	36	ns
Restaurant	53	68	ns	65	23	61	35	4	ns
Take care of children	12	9	ns	12	0	0	0	0	ns



Hairdresser	59	56	ns	53	19	58	37	5	ns
Shopping	65	79	ns	76	27	74	22	4	0.001
Other shopping	56	68	ns	71	23	87	9	4	<0.0001
Post	26	12	ns	26	4	50	50	0	ns
Bank	41	44	ns	56	15	87	13	0	ns
Pharmacy	50	53	ns	50	18	44	22	34	0.001
Library	21	15	ns	21	5	60	20	20	ns
Union/church	32	32	ns	41	11	72	14	14	ns
Culture, sport	26	38	ns	29	13	85	15	0	ns
Hobby, exercise	29	29	ns	29	10	83	17	0	ns
Go for a walk/ride	71	97	ns	91	33	91	8	1	<0.0001
Family, friends	85	82	ns	82	27	56	22	4	0.002
Work/studies	6	9	ns	18	3	66	33	1	-
Gardening	23	26	ns	15	9	75	13	12	ns

---

- a) Sign test.
- b) No additional significant changes in participation frequency occurred between 4-month and 1-year follow-up and therefore no p-value is reported.
- c) Number of participants that answered the frequency-scale at both baseline and 4-month follow-up, utilized to calculate the changes in easiness. Those responding that they never performed a certain participation aspect at baseline but had started doing it four months later are considered as gainers in easiness.
- d) No other significant changes in easiness/difficulty occurred between 4-month and 1-year follow-up and therefore not presented.
- e) The sign test is based on data from the ordinal 5-step scale.