

**This is an electronic reprint of the original article.  
This reprint *may differ* from the original in pagination and typographic detail.**

**Author(s):** Portegijs, Erja; Rantakokko, Merja; Viljanen, Anne; Sipilä, Sarianna; Rantanen, Taina

**Title:** Is frailty associated with life-space mobility and perceived autonomy in participation outdoors? : A longitudinal study

**Year:** 2016

**Version:**

**Please cite the original version:**

Portegijs, E., Rantakokko, M., Viljanen, A., Sipilä, S., & Rantanen, T. (2016). Is frailty associated with life-space mobility and perceived autonomy in participation outdoors? : A longitudinal study. *Age and Ageing*, 45(5), 550-553.  
<https://doi.org/10.1093/ageing/afw072>

All material supplied via JYX is protected by copyright and other intellectual property rights, and duplication or sale of all or part of any of the repository collections is not permitted, except that material may be duplicated by you for your research use or educational purposes in electronic or print form. You must obtain permission for any other use. Electronic or print copies may not be offered, whether for sale or otherwise to anyone who is not an authorised user.

**Is frailty associated with life-space mobility and perceived autonomy in participation outdoors? – A longitudinal study**

Erja Portegijs<sup>1</sup>, PhD, Merja Rantakokko<sup>1</sup>, PhD, Anne Viljanen<sup>1</sup>, PhD, Sarianna Sipilä<sup>1</sup>, PhD, Taina Rantanen<sup>1</sup>, PhD

<sup>1</sup> Gerontology Research Center and Department of Health Sciences, University of Jyväskylä, Finland

Corresponding author:

Erja Portegijs

Gerontology Research Center and Department of Health Sciences

P.O. Box 35 (viv)

FI-40014 University of Jyväskylä

Finland

email: [erja.portegijs@jyu.fi](mailto:erja.portegijs@jyu.fi)

phone: +358 40 481 4347

**Word count:** 1474

**Keywords:** Mobility limitation, participation, frailty, disability, aging

**Running page headline:** Frailty and community participation

## **Is frailty associated with life-space mobility and perceived autonomy in participation outdoors? – A longitudinal study**

**BACKGROUND.** Essential aspects of independence in community mobility among older people concern the control over where, when and how to participate (perceived autonomy), and actual mobility (life-space mobility; frequency, distance and need of assistance). We studied relationships between frailty and life-space mobility and perceived autonomy in participation outdoors among community-dwelling 75-90-years-old people.

**METHODS.** Longitudinal analyses of the “Life-space mobility in old age” cohort study (N=753). Life-space mobility (Life-Space Assessment, range 0-120) and perceived autonomy in participation outdoors (Impact on Participation and Autonomy subscale “autonomy outdoors”, range 0-20) were assessed at baseline and two years later. Baseline frailty indicators were: unintentional weight loss (self-report), weakness (5 times chair rise), exhaustion (self-report), slowness (2.44m walk), and low physical activity (self-report).

**RESULTS.** In total, 53% had no frailty, 43% pre-frailty (1-2 frailty indicators) and 4% frailty ( $\geq 3$  indicators). Generalized Estimation Equation models showed that life-space mobility was lower among those with frailty and pre-frailty compared to those without frailty and in addition, declined at a faster pace. Perceived autonomy in participation outdoors was more restricted among those with frailty and pre-frailty compared to those without frailty, but the rate of decline did not differ.

**CONCLUSIONS.** Frailty was associated with more restricted life-space mobility and poorer perceived autonomy in the decision making concerning community mobility. Over the follow-up, frailty predicted a steeper decline in life-space mobility but not in perceived autonomy. Further study is warranted determine whether compensation strategies or changes in valuation of activities underlie this discrepancy.

## INTRODUCTION

The prevalence of participation restrictions among community-dwelling older people increases with age [1] and often relates to mobility activities in the community [1,2]. Participation restrictions refer to difficulties a person may experience in life situations. An important quantifiable indicator of participation is life-space mobility, which reflects the spatial area a person moves through in daily life, the frequency of movement and need of assistance [3]. It is a measure of how active or mobile a person is. Another important dimension is perceived autonomy in community participation. Perceived autonomy is optimal when a person perceives full control over the decision making of where, when and how to participate [1,4]. Persons with more restricted life-space space or those who depend on assistive devices or personal assistance for out-of-home activities may have less opportunities to participate in meaningful activities in the community [3,5]. However, they may not necessarily perceive their possibilities as restricted [4,6], if they are able to compensate for deficits using available resources (e.g. transportation, social support) [7-9] or if they value different aspects in their life [10,11].

Frailty is a state in which a person does not have reserve capacity to overcome adverse events such as illness or injury, and precedes disability in activities of daily living [12,13]. Although frailty is said to involve multiple deficits, there is no consensus on how to assess frailty (medical conditions and/or functional deficits) [12]. Frailty and pre-frailty defined according to the frailty phenotype – describing functional deficits in five areas – have been associated with increased risks for falls, hospitalization, institutionalization, and mortality [13]. According to our knowledge, relationships between frailty and life-space mobility and perceived autonomy in participation outdoors have not yet been studied. Going less

frequently to the neighborhood and town, a situation reflecting restricted life-space mobility, has been associated with development of the frailty phenotype [14]. Furthermore, reduced general mastery and self-management have been associated with frailty phenotype [15].

We studied relationships between baseline physical frailty status and a) changes in life-space mobility, and b) changes in perceived autonomy in participation outdoors over a two-year period in community-dwelling 75-90-years-old people.

## **METHODS**

These are longitudinal analyses of the “Life-space mobility in old age” (LISPE) cohort comprising 75-90-years-old community-dwelling people living in Muurame and Jyväskylä in Central Finland. The study design and methods have been published previously [16,17]. Briefly, a random sample of 2550 was drawn from the population register. These persons were informed about the study and interviewed by phone to determine eligibility (living independently, able to communicate, residing in recruitment area and willing to participate). Participants signed an informed consent, after which baseline data (N=848) were collected in a home interview. One (N=816) and two (N=761) years later participants were re-interviewed over the phone. By the time of the second follow-up 15 participants had moved to an institutional care facility, 41 participants had died, 12 participants were excluded due to communication problems and 6 participants due to a move outside of the study area. In addition there were non-respondents due to poor health (n=5), unwillingness to participate (n=6) or being out of reach (n=2). The study was approved by the University of Jyväskylä Ethical Committee.

**Life-space mobility** during the preceding 4 weeks was determined with the Life-Space Assessment [3] at baseline and at the one- and two-year follow-up. For each life-space level (bedroom, other rooms, outside home, neighborhood, town, beyond), participants rated how many days a week they attained that level and whether they needed help from another person or assistive devices. A composite score reflecting the distance, frequency and assistance was calculated (range 0-120); higher scores indicate greater mobility. Validity and test-retest reliability (ICC=0.72-.96) of the LSA has been established [3,18,19].

**Perceived autonomy in participation outdoors** was assessed with the Impact on Participation and Autonomy subscale on “autonomy outdoors” [4] at baseline and the two-year follow-up. Participants were asked to rate perceived chances in a) visiting relatives and friends, b) making trips and traveling, c) spending leisure time, d) meeting other people, and e) living life the way they want. The response categories ranged from 0 (very good) to 4 (very poor). A sum score for perceived autonomy in participation outdoors was calculated (range 0-20); higher scores indicate more restrictions. Validity and test-retest reliability (ICC=0.91) of the IPA has been established [4,20].

**Physical frailty phenotype** indicators were: Self-reported *unintentional weight loss* of >5kg in the past year, self-reported *exhaustion* (questions 7 and 20 of Centre for Epidemiologic studies Depression Scale), and *low physical activity* (self-reporting only light physical activity or less [21]), *weakness* (test-based age- and gender-based cut-off values for 5 times chair rise time or inability [22,23]), *slowness* (test-based age- and gender-based cut-off values of 2.44m walk time or inability[22,23]). *Frailty status* was defined as no frailty (0 indicators present), pre-frailty (1-2 indicators), and frailty ( $\geq 3$  indicators) [13].

Self-reported **number of chronic diseases** was calculated from a list of 22 physician diagnosed chronic diseases and an additional open-ended question about any other physician diagnosed chronic conditions. The Mini-Mental State Examination score (range 0-30) was used as an indicator of **cognitive function**. Data of one participant were excluded from all adjusted analyses due to severely impaired sight that obstructed the administering of the Mini-Mental State Examination. **Age** and **gender** were derived from the national register.

For 10 participants, frailty status could not be defined due to missing frailty indicators, 2 of which were lost to follow-up. Thus, the longitudinal analyses included data of 753 participants. Generalized estimation equation models with unstructured working correlation matrix were used to determine whether life-space mobility and perceived autonomy in participation outdoors (group effect) and their change over time differed between the frailty groups (interaction effect of group by time). Regression coefficients (B), standard errors (SE) and p-values are reported. The analyses were first adjusted for age and sex, and subsequently for number of chronic diseases, and cognitive function. In case of missing data on the outcome variable (life-space mobility N=5 and N=4; and perceived autonomy N=12) at the one- and two-year follow-up, respectively, multivariate imputation by the chained equations (MICE) procedure [24] was used in the generalized estimation equation modeling. IBM SPSS Statistics 20 was used for statistical analyses, and statistical significance was set at  $P < .05$ .

## RESULTS

Of the analytic sample (N=753), 64% was female, and the participants' mean age was 80.4±standard deviation 4.1 and the number of chronic diseases reported was 4.4±2.4. At baseline, the life-space mobility score was 65.4±20.1 and the perceived autonomy in participation outdoors score was 6.0±3.7. At baseline, 53% (n=401) of the participants was without frailty, 43% (n=323) was with pre-frailty, and 4% (n=29) with frailty.

The age and sex adjusted generalized estimation equation model showed that life-space mobility was more limited among those with pre-frailty (B=-12.3, SE=1.6, p<.001) and frailty (B=26.0, SE=3.8, p<.001) compared to the reference group without frailty. Figure 1a shows that the rate of decline over time in life-space mobility score was greater among those with pre-frailty and frailty than among those without frailty at baseline. After adjustment for potential confounders, the relationships remained statistically significant (group effect pre-frailty p<.001, frailty p<.001, group by time interaction effect pre-frailty p=.024, frailty p=.007).

Perceived autonomy in participation outdoors was more restricted among those with pre-frailty (B=1.7, SE=0.4, p<.001) and frailty (B=5.6, SE=1.3, p<.001) compared to the reference group without frailty in the age and sex adjusted generalized estimation equation model. The group by time interaction effect was not statistically significant, thus indicating a similar rate of decline in all groups (Figure 1b). When the model was fully adjusted, results were similar (group effect pre-frailty p=.004, frailty p<.001, group by time interaction effect pre-frailty p=.800, frailty p=.285).



## DISCUSSION

This study shows that participants with higher levels of baseline physical frailty had more restrictions in life-space mobility and in perceived autonomy in participation outdoors. Thus, both the actual community mobility and the perceived control in the decision making, of when, where and how one wants to go outdoors, were negatively affected by frailty status. The lack of reserve capacity that physical frailty represents [12,13] was associated only with a greater decline in life-space mobility over the two-year follow-up, while changes in perceived autonomy in participation outdoors over time were similar regardless of frailty status. This is in line with previous studies, which also showed that actual and perceived participation should be considered separately [25,26]. In addition, a multi-factorial intervention in participants with some degree of frailty improved life-space mobility, but not satisfaction with participation [27]. Further study is warranted to determine whether compensation strategies [7,8] or changes in valuation of activities [10,11], which were not assessed in our study, may underlie this discrepancy between actual and perceived participation.

This paper is based on a large population-based sample of older people. As in most research involving older people, more frail older people were under-represented in the sample, potentially leading to underestimation of associations found.

## **KEY POINTS**

- Frailty was associated with more restrictions in actual and perceived community participation.
- Frailty was associated with greater decline in life-space mobility over two-years of follow-up.
- Changes in perceived autonomy in participation outdoors over time were independent of frailty status.
- Different factors may underlie restrictions in actual and perceived community participation.

## **CONFLICT OF INTEREST**

The authors have no conflict of interest.

## **DECLARATION OF SOURCES OF FUNDING**

This work was supported by the Academy of Finland [grant numbers 255403 to [TR], 285747 to [MR]]; and the Finnish Ministry of Education and Culture to [TR] and [EP]. The financial sponsors played no role in the design, execution, analysis and interpretation of data, or writing of the study.

## ACKNOWLEDGEMENTS

We thank the participants for their time and effort to participate in our study. Gerontology Research Center is a joint effort between the University of Jyväskylä and the University of Tampere.

## REFERENCES

1. Wilkie R, Peat G, Thomas E, Croft P. The prevalence of person-perceived participation restriction in community-dwelling older adults. *Qual Life Res* 2006;15:1471-9.
2. Fairhall N, Sherrington C, Kurrle SE, Lord SR, Cameron ID. ICF participation restriction is common in frail, community-dwelling older people: an observational cross-sectional study. *Physiotherapy* 2011;97:26-32.
3. Baker PS, Bodner EV, Allman RM. Measuring life-space mobility in community-dwelling older adults. *J Am Geriatr Soc* 2003;51:1610-4.
4. Cardol M, de Haan RJ, van den Bos GA, de Jong BA, de Groot IJ. The development of a handicap assessment questionnaire: the Impact on Participation and Autonomy (IPA). *Clin Rehabil* 1999;13:411-9.
5. Barnes LL, Wilson RS, Bienias JL, et al. Correlates of life space in a volunteer cohort of older adults. *Exp Aging Res* 2007;33:77-93.
6. Wilkie R, Peat G, Thomas E, Croft P: Factors associated with restricted mobility outside the home in community-dwelling adults ages fifty years and older with knee pain: an example

of use of the International Classification of Functioning to investigate participation restriction. *Arthritis Rheum* 2007;57:1381-9.

7. Pine ZM, Gurland B, Chren MM. Use of a cane for ambulation: marker and mitigator of impairment in older people who report no difficulty walking. *J Am Geriatr Soc* 2002;50:263-8.

8. Viljanen A, Mikkola TM, Rantakokko M, Portegijs E, Rantanen T. The Association between Transportation and Life-space Mobility in Community Dwelling Older People With or Without Walking Difficulties. *J Aging Health* 2015 (in press).

9. Baltes PB, Baltes MM. Psychological perspectives on successful aging: the model of selective optimization with compensation. In Baltes PB, Baltes MM, eds. *Successful aging: perspectives from the behavioral sciences*. Cambridge: Cambridge University Press, 1990:1-34.

10. Puts MT, Shekary N, Widdershoven G, Heldens J, Lips P, Deeg DJ. What does quality of life mean to older frail and non-frail community-dwelling adults in the Netherlands? *Qual Life Res* 2007;16:263-77.

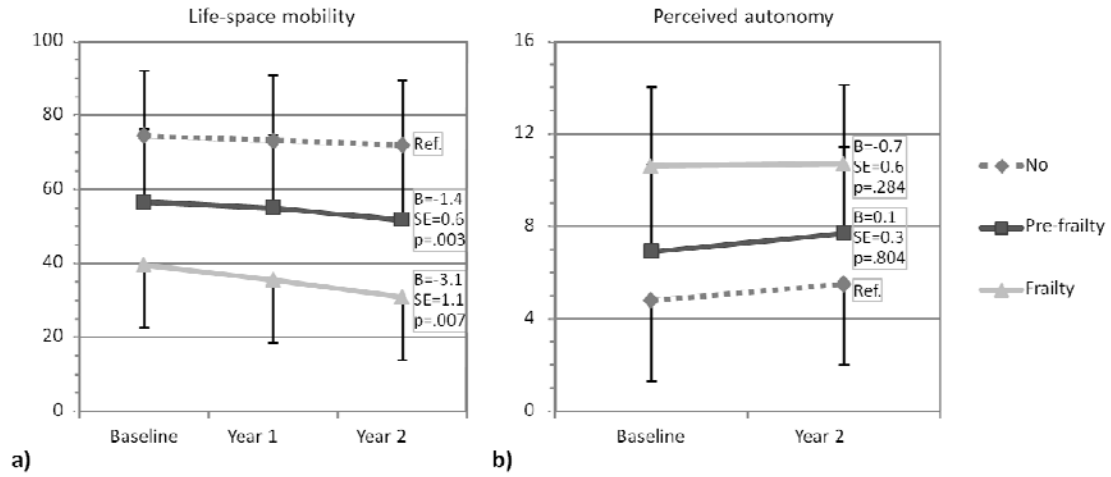
11. Schwartz CE. Applications of response shift theory and methods to participation measurement: a brief history of a young field. *Arch Phys Med Rehabil* 2010;91(9 Suppl):S38-43.

12. Rodriguez-Manas L, Feart C, Mann G, et al. Searching for an operational definition of frailty: a Delphi method based consensus statement: the frailty operative definition-consensus conference project. *J Gerontol A Biol Sci Med Sci* 2013;68:62-7.

13. Fried LP, Tangen CM, Walston J, et al. Frailty in older adults: evidence for a phenotype. *J Gerontol A Biol Sci Med Sci* 2001;56:M146-56.
14. Xue QL, Fried LP, Glass TA, Laffan A, Chaves PH. Life-space constriction, development of frailty, and the competing risk of mortality: the Women's Health And Aging Study I. *Am J Epidemiol* 2008;167:240-8.
15. Op het Veld LP, van Rossum E, Kempen GI, de Vet HC, Hajema K, Beurskens AJ. Fried phenotype of frailty: cross-sectional comparison of three frailty stages on various health domains. *BMC Geriatr* 2015;15:77.
16. Rantanen T, Portegijs E, Viljanen A, et al. Individual and environmental factors underlying life space of older people - study protocol and design of a cohort study on life-space mobility in old age (LISPE). *BMC Public Health* 2012;12:1018.
17. Rantakokko M, Portegijs E, Viljanen A, Iwarsson S, Kauppinen M, Rantanen T. Changes in life-space mobility and quality of life among community-dwelling older people: a 2-year follow-up study. *Qual Life Res* 2015 (in press).
18. Peel C, Sawyer Baker P, Roth DL, Brown CJ, Brodner EV, Allman RM. Assessing mobility in older adults: the UAB Study of Aging Life-Space Assessment. *Phys Ther* 2005;85:1008-19.
19. Portegijs E, Iwarsson S, Rantakokko M, Viljanen A, Rantanen T. Life-space mobility assessment in older people in Finland; measurement properties in winter and spring. *BMC Res Notes* 2014;7:323.

20. Cardol M, de Haan RJ, de Jong BA, van den Bos GA, de Groot IJ. Psychometric properties of the Impact on Participation and Autonomy Questionnaire. *Arch Phys Med Rehabil* 2001;82:210-6.
21. Grimby G: Physical activity and muscle training in the elderly. *Acta Med Scand Suppl* 1986;711:233-7.
22. Guralnik JM, Simonsick EM, Ferrucci L, et al. A short physical performance battery assessing lower extremity function: association with self-reported disability and prediction of mortality and nursing home admission. *J Gerontol* 1994;49:M85-94.
23. Mänty M, Sihvonen S, Hulkko T, Lounamaa A. Iäkkäiden henkilöiden kaatumistapaturmat. Opas kaatumisten ja murtumien ehkäisyyn. Helsinki: KTL-National Public Health Institute, Finland, 2007:45-52.
24. Azur MJ, Stuart EA, Frangakis C, Leaf PJ. Multiple imputation by chained equations: what is it and how does it work? *Int J Methods Psychiatr Res* 2011;20:40-9.
25. Levasseur M, Desrosiers J, Whiteneck G. Accomplishment level and satisfaction with social participation of older adults: association with quality of life and best correlates. *Qual Life Res* 2010;19:665-75.
26. Arnadóttir SA, Gunnarsdóttir ED, Stenlund H, Lundin-Olsson L. Participation frequency and perceived participation restrictions at older age: applying the International Classification of Functioning, Disability and Health (ICF) framework. *Disabil Rehabil* 2011;33:2208-16.
27. Fairhall N, Sherrington C, Kurrle SE, Lord SR, Lockwood K, Cameron ID. Effect of a multifactorial interdisciplinary intervention on mobility-related disability in frail older people: randomised controlled trial. *BMC Med* 2012;10:120.

**FIGURE**



**Figure 1.** Average (and standard deviation) life-space mobility (a) and perceived autonomy in outdoor participation (b) scores at baseline and follow-up according to baseline frailty level, and the group by time interaction effects derived from age and sex adjusted generalized estimation equations models (B=regression coefficient, SE=standard error, Ref.=reference group).