Onset of mobility limitations in old age: the combined effect of socioeconomic position and social relations

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Abstract

Purpose: to examine the combined effect of cohabitation status and social participation, respectively, and socioeconomic position on onset of mobility limitations in a prospective study among older Danes.

Design and methods: logistic regression analyses with combined exposure variables were performed in a study population of 2,839 older men and women from the Danish Intervention Study on Preventive Home Visits.

Results: among men low financial assets, living alone or having low social participation significantly increased the odds ratios (OR) for onset of mobility limitations. Among women only low financial assets and low social participation significantly increased the ORs for onset of mobility limitations. Analyses with combined exposure variables showed that simultaneous exposure to low financial assets and poor social relations significantly increased the ORs for onset of mobility limitations among both genders, yet the tendencies appeared stronger for males. In particular, men with simultaneous exposure to low financial assets and low social participation had increased odds ratios for onset of mobility limitations, OR = 5.36 (2.51–11.47), compared with the non-exposed.

Conclusion: the study suggests that future interventions to increase social participation might alleviate the negative effects on mobility experienced by older people in low socioeconomic position, perhaps especially among older males.

Keywords: onset of mobility limitations, socioeconomic position, living alone, social participation, older people

Introduction

The study of the interplay between social determinants of mobility limitations is essential when trying to establish factors of importance to the well-being and functional independence of older people in everyday life.

Many social determinants predicting declines in various stages of the disablement process [1] have been identified [2]. Two particularly well-studied predictors of mobility are poor social relations, e.g. living alone or low social participation, and low socioeconomic position, yet the combined effect of these predictors on mobility is not fully elucidated.

Living alone (or being unmarried) has been shown to increase the risk of functional disability among both genders in some studies [3, 4], whereas other studies have presented an increased risk only among men [5] or women [6]. More unambiguously low social participation has been shown to increase the risk of functional disability [7].

Social inequality in mobility limitations among older people is thoroughly described, with an increased risk of mobility limitations among individuals in low socioeconomic position [8, 9].

Studies of the combined effect of social relations and socioeconomic position on functional ability among older people are scarce with diverging findings. Some studies show more deleterious effects of measures of negative social relations on functional ability among older people with low socioeconomic position, compared with high socioeconomic position [10, 11]. Yet other studies have failed to find socioeconomic differences in the effect of social relations on functional ability [12, 13].

The identification of a possibly modifiable factor, e.g. some aspects of social relations, which might compensate for some of the negative effect of low socioeconomic position on mobility, would potentially have a large impact for the health and well-being of older people.

The aim of the present study was to examine the combined effect of cohabitation status and social participation, respectively, and socioeconomic position on onset of mobility limitations in a prospective study among older Danish men and women.

Methods

Study population

The present study was based on secondary analyses of data from the Danish Intervention Study on Preventive Home Visits, a randomised controlled intervention study which is described in detail elsewhere [14], including questionnaire and register-based data from baseline in 1998–99 and outcomes from follow-up in 2001–02. The baseline study population comprised all non-institutionalised citizens in 34 Danish municipalities born in 1918/1923–24 (80 or 75 years old, respectively), \( n = 4,060 \), participation rate 70%.

Analyses were based on participants with no mobility limitations at baseline \( n = 3,144 \). We excluded 305 individuals with missing values on some included variables or who did not survive until follow-up \( n = 2,839 \).

Variables

Mobility was estimated by the Mobility-Help Scale, a validated scale [15], which measures how many mobility
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Analyses including the combined exposure variable of low financial assets and social participation were adjusted for cohabitation status as a potential confounder. Analyses including the combined exposure variable of low financial assets and cohabitation were not adjusted for social participation, as social participation is a potential mediator [17] and therefore should not be adjusted for.

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Results

At 3-year follow-up 14% men and 23% women experienced onset of mobility limitations. Significantly more women than men had low financial assets or lived alone, whereas significantly more men than women had low social participation (Table 1). The majority of cohabiting men (98%) and women (95%) lived with spouse or cohabiting partner.

The majority of males (66%) had high financial assets and was cohabiting, whereas the majority of women (48%) had high financial assets and was living alone. Three percent of men and 11% of women had low financial assets and were living alone.

Combining financial assets and social participation showed similar tendencies among both genders, with the majority having high financial assets and high social participation, but there was still a significant gender difference. Eleven percent men and 4% women had high financial assets and low social participation, and 12% men and 22% women had low financial assets and high social participation.

Among men low financial assets, living alone or having low social participation significantly increased the odds ratios for onset of mobility limitations at 3-year follow-up (Table 2). Among women only low financial assets and low social participation significantly increased the odds ratios for onset of mobility limitations.

Analyses with the combined exposure variables (Table 3) generally showed that simultaneous exposure to low financial assets and poor social relations significantly increased the odds ratios for onset of mobility limitations among both genders, yet the tendencies appeared stronger for males.

Men with low financial assets and living alone had 3-fold higher odds [OR (95% CI) = 3.04 (1.41–6.56)] of onset of mobility limitations, compared with the non-exposed. Men with low financial assets and low social participation had 5-fold higher odds [OR (95% CI) = 5.36 (2.51–11.47)] of onset of mobility limitations compared...
with the non-exposed, indicating more than an additive effect of low financial assets and low social participation.

Women with low financial assets and low social participation had 2-fold higher odds of onset of mobility limitations compared with the non-exposed [OR (95% CI) = 2.29 (1.22–4.29)].

**Discussion**

This study aimed at investigating the combined effect of cohabitation status and social participation, respectively, and socioeconomic position measured by financial assets on onset of mobility limitations.

Analyses showed that simultaneous exposure to either living alone or having low social participation and to low financial assets significantly increased the odds for onset of mobility limitations among men as well as women, compared with the non-exposed. In particular, men with simultaneous exposure to low financial assets and low social participation had increased odds ratios for onset of mobility limitations. This could indicate a synergistic effect of low financial assets and low social participation on the risk of mobility limitations among older men.
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Table 3. Odds ratios (95% CI) for onset of mobility limitations (3-year follow-up) by financial assets/cohabitation status and financial assets/social participation at baseline, stratified by gender

<table>
<thead>
<tr>
<th>Financial assets and cohabitation status</th>
<th>n/cases</th>
<th>Model 1 OR (95% CI)</th>
<th>Model 2 OR (95% CI)</th>
<th>Model 3 OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial assets and cohabitation status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High assets + cohabiting</td>
<td>838/94</td>
<td>1.00 (0.87–1.14)</td>
<td>1.00 (0.87–1.14)</td>
<td>1.00 (0.87–1.14)</td>
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<tr>
<td>High assets + living alone</td>
<td>259/48</td>
<td>1.80 (1.23–2.63)</td>
<td>1.75 (1.19–2.56)</td>
<td>1.75 (1.19–2.56)</td>
</tr>
<tr>
<td>Low assets + cohabiting</td>
<td>145/21</td>
<td>2.15 (1.37–3.38)</td>
<td>2.13 (1.35–3.36)</td>
<td>2.13 (1.35–3.36)</td>
</tr>
<tr>
<td>Low assets + living alone</td>
<td>36/10</td>
<td>3.04 (2.12–4.37)</td>
<td>3.04 (2.12–4.37)</td>
<td>3.04 (2.12–4.37)</td>
</tr>
<tr>
<td>Financial assets and social participation</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>High assets + high participation</td>
<td>960/117</td>
<td>1.00 (0.88–1.14)</td>
<td>1.00 (0.88–1.14)</td>
<td>1.00 (0.88–1.14)</td>
</tr>
<tr>
<td>High assets + low participation</td>
<td>137/25</td>
<td>1.61 (1.00–2.59)</td>
<td>1.56 (0.96–2.51)</td>
<td>1.56 (0.96–2.51)</td>
</tr>
<tr>
<td>Low assets + high participation</td>
<td>151/28</td>
<td>1.64 (1.04–2.58)</td>
<td>1.61 (1.02–2.55)</td>
<td>1.61 (1.02–2.55)</td>
</tr>
<tr>
<td>Low assets + low participation</td>
<td>30/13</td>
<td>5.51 (2.61–11.64)</td>
<td>5.82 (2.73–12.39)</td>
<td>5.36 (2.51–11.47)</td>
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<tr>
<td>Financial assets and cohabitation status</td>
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<td></td>
</tr>
<tr>
<td>High assets + cohabiting</td>
<td>425/82</td>
<td>1.00 (0.88–1.14)</td>
<td>1.00 (0.88–1.14)</td>
<td>1.00 (0.88–1.14)</td>
</tr>
<tr>
<td>High assets + living alone</td>
<td>749/168</td>
<td>1.21 (0.90–1.63)</td>
<td>1.10 (0.81–1.48)</td>
<td>1.10 (0.81–1.48)</td>
</tr>
<tr>
<td>Low assets + cohabiting</td>
<td>213/51</td>
<td>1.32 (0.89–1.96)</td>
<td>1.34 (0.90–1.99)</td>
<td>1.34 (0.90–1.99)</td>
</tr>
<tr>
<td>Low assets + living alone</td>
<td>174/52</td>
<td>1.78 (1.19–2.67)</td>
<td>1.62 (1.07–2.43)</td>
<td>1.62 (1.07–2.43)</td>
</tr>
<tr>
<td>Financial assets and social participation</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>High assets + high participation</td>
<td>1,110/232</td>
<td>1.00 (0.88–1.14)</td>
<td>1.00 (0.88–1.14)</td>
<td>1.00 (0.88–1.14)</td>
</tr>
<tr>
<td>High assets + low participation</td>
<td>64/18</td>
<td>1.48 (0.84–2.60)</td>
<td>1.51 (0.86–2.68)</td>
<td>1.54 (0.87–2.72)</td>
</tr>
<tr>
<td>Low assets + high participation</td>
<td>340/87</td>
<td>1.30 (0.98–1.73)</td>
<td>1.32 (0.99–1.76)</td>
<td>1.35 (1.01–1.81)</td>
</tr>
<tr>
<td>Low assets + low participation</td>
<td>47/16</td>
<td>1.95 (1.05–3.63)</td>
<td>2.21 (1.18–4.14)</td>
<td>2.29 (1.22–4.29)</td>
</tr>
</tbody>
</table>

aCrude model.
bAdjusted for age.
cAdjusted for age and cohabitation status.

Besides efforts to improve the financial security of older people, these findings suggest that interventions aiming at improving the social participation of older men might potentially alleviate some of the negative effect of having a low socioeconomic position on mobility. However, we cannot conclude if cohabitation can compensate for the negative effect of having a low socioeconomic position on mobility.

To our knowledge, no other studies have investigated the combined effect of cohabitation status and social participation, respectively, and financial assets on mobility limitations in a longitudinal setting. However, the interaction between other measures of social relations and socioeconomic position in predicting functional ability has been studied with diverging findings [10–13].

Inconsistent findings regarding socioeconomic differences in the effect of social relations are present also on other health-outcomes, such as cardiovascular risk-factors, self-rated health, chronic conditions, high blood pressure, medication and psychiatric morbidity [18–20].

Explanations for the diverse effect of social relations on functional ability seen in different social positions have been suggested. Older people in low socioeconomic position are more likely to be exposed to inadequate or unsafe housing conditions, inadequate nutrition and crime in the neighbourhood [9, 11]. These factors may increase the need of social support [9]. Older people of low socioeconomic position may also suffer more from insufficient social contacts and support. Individuals with higher socioeconomic position can better afford healthcare, proper nutrition, transportation, besides having the opportunity to pay for personal assistance and thereby are better at compensating for poor social relations [9].

Our finding that older men may be more vulnerable than women to simultaneous exposure to low social participation and low socioeconomic position, even though the mobility of both genders are negatively affected by low social participation and low socioeconomic position, separately and concomitantly, may originate from general underlying gender differences in social networks. Older men appear to rely more on their spouse for social support than do women, perhaps entailing decreased independent abilities to maintain a social network and a high social participation [21]. Older women may be better than men to comprehend a life with low social participation and to enjoy some time alone, as women may throughout their lives have experienced higher levels of care-giving, strains and a lack of reciprocity in their relations to others [13]. Gender might thus be an even stronger factor than socioeconomic position in determining the effect of social participation on mobility in old age.

There is no general consensus on how to most appropriately measure socioeconomic position when studying social differences in mobility among older people. Robert and House [9] suggested financial assets. Measures of material wealth reflect a cumulative influence of social circumstances throughout life [8]. This
makes financial assets suitable for assessing effects of socioeconomic position longitudinally, as financial assets have been gained over many years and may not be affected by mobility in old age, decreasing the risk of reverse causality. We dichotomised financial assets in order to make a four-category combined exposure variable with the dichotomised measures of social relations. We distinguished the 20% with lowest financial assets from the top 80%, following the argument by Robert and House [9] that the largest contrast between financial assets-categories when predicting poor health is between the lowest end of the assets distribution and the remainder.

The longitudinal design of our study and starting from a population with no mobility limitations at baseline decreases the risk of reverse causality when studying the combined effect of financial assets and social relations on onset of mobility limitations.

A weakness of our study is the lack of an objective measure of mobility or physical function, yet studies have shown that mobility as measured by the Mobility-Help scale is related to physical function tests on walking speed and stair-walking [22]. Generally, self-reported measures of function might better capture function in the context of social activities and roles than performance-based measures, and may thus be more relevant in studies concerning factors of importance for well-being and independent living in everyday life [23]. A validation study of the Mobility-Help scale using the Rasch analysis showed that all participants with a given index score on the scale had the same probability of scoring on an item regardless of age, gender, household composition and self-rated health [15]. Patterns of association between measures of social relations and onset of mobility limitations are similar whether the scale is used as a continuous or a dichotomous scale [7]. Furthermore our finding of 14%/23% of men/women experiencing onset of mobility limitations at follow-up corresponds well with findings from other studies on mobility limitations in Scandinavian populations [6].

Another weakness of our study is the potential misclassification of individuals according to cohabitation status and social participation, as changes into living alone or low social participation might negatively affect mobility. This might entail an underestimation of our findings.

We did consider a range of potential confounders of the association between financial assets, social relations and onset of mobility limitations; physical activity, receiving home help, expenses for medicine and mental well-being. These variables might be situated in the causal sequence between financial assets, cohabitation status and/or social participation, respectively, and onset of mobility limitations and might therefore be mediators [24–26]. Adjusting for mediators could lead to an underestimation of the studied effect. Therefore, we chose not to include these factors in our final analyses. We are aware that these factors might explain some of the combined effect of financial assets and social relations on onset of mobility limitations, yet it was not an aim of this study to identify explanatory mechanisms.

A common approach for assessing the interplay between exposures is to include a product term, thereby identifying statistical interaction on the underlying scale of the statistical model [27], whether additive or multiplicative. This has been done by many of the papers referred to here [10, 11, 13]. Owing to a lack of power many studies may fail to find significant statistical interaction terms, and conclude no interaction [27].

Causal interaction occurs when the effect of one exposure is dependent on the presence of another exposure. Interaction is a departure from additivity of the effects of each exposure. Measures for assessment of departure from additivity have been developed [16], even when the underlying model is multiplicative, as in this study. There are, however, several caveats for using these measures, especially when applying odds ratios and when the outcome is frequent [28].

Whether combined effects should be evaluated by adding a product term or by studying causal interaction is much debated [29]. We chose to follow the recommendations of Strengthening the Reporting of Observational Studies in Epidemiology [29], and presented separate effects of both exposures as well as their combined effect, with a joint reference group with no exposures.

Study participants excluded due to having missing values on included variables, including 172 individuals who died in the follow-up period, were more likely to be male, in the oldest age-group, have lower social participation, have lower financial assets and to be less physically active at baseline. As these factors characterise individuals with a high risk of functional disability, the exclusion of these individuals might have underestimated our findings. Individuals who died in the follow-up period have possibly experienced mobility limitations prior to death. However, analyses including these individuals as cases with onset of mobility limitations did not change the results.

Conclusion

Based on these findings and findings from another study on these data, showing that men simultaneously living alone and having low social participation had a particularly high risk of mobility disability [30], a special attention towards financially challenged older men, living alone and not being otherwise socially active is suggested. Yet it should be kept in mind that older women with low social participation also experience increased odds of onset of mobility limitations. Future interventions to increase social participation might alleviate the negative effects on independent functioning in everyday life experienced by older people in low socioeconomic position [12].
Key points

• This study showed that low socioeconomic position and low social participation increased the odds ratios of onset of mobility limitations among older men as well as women, whereas living alone was associated to onset of mobility limitations among males only.

• Simultaneous exposure to either living alone or having low social participation and to low financial assets significantly increased the odds for onset of mobility limitations among both genders, compared with the non-exposed. In particular, men with simultaneous exposure to low financial assets and low social participation had increased odds ratios for onset of mobility limitations.

• Future interventions to increase social participation might alleviate the negative effects on independent functioning in everyday life experienced by older people in low socioeconomic position.

References

Behavioural disorders, disability and quality of life in Parkinson’s disease

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Abstract

Background: although non-motor symptoms of Parkinson’s disease (PD) are known to adversely affect disability and health-related quality of life, the impact that specific disorders of reward and motivation have remains unclear. Impulse control disorders are more likely in those with a younger disease onset although there is no strong evidence to date that apathy is related to age of onset or correlated with a longer duration of disease.

Objective: to examine the effects of apathy and impulse control disorders on disability and health-related quality of life.

Methods: a total of 99 non-demented participants with PD (35 with impulse control disorders, 26 with apathy and 38 with neither behavioural complication) were assessed using the Unified Parkinson’s Disease Rating Scale (Activities of Daily Living component) and the Schwab–England scale to evaluate disability, and the PDQ (eight items) to assess quality of life.

Results: quality of life was reduced in both behavioural groups compared with participants without either condition. Disability was greater in the group with apathy. Variation in disability score (56%, P < 0.001) was explained by greater levels of apathy, depression, motor impairment and longer disease duration. Variation in quality of life score (54%, P < 0.001) was explained by higher levels of impulsivity, depression, dopaminergic load, motor complications, working memory problems and younger age at onset.

Conclusion: apathy and impulsivity negatively impact on disability and health-related quality of life, emphasising the importance of effective diagnosis and management of these PD-related behavioural disturbances.

Keywords: Parkinson’s disease, disability, quality of life, impulse control disorders, apathy, elderly

Introduction

It is now accepted that in Parkinson’s disease (PD), a neurodegenerative motor disorder, non-motor features (including autonomic symptoms, sleep and sensory disturbances) are almost ubiquitous and often pre-date the motor features of the disorder [1]. In particular, neuropsychiatric symptoms can be burdensome to patients and carers alike,