

## Education of preventive home visitors: the effects on change in tiredness in daily activities

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**Abstract** The objective was to investigate whether a 3-year educational intervention towards primary health care professionals had effect on change in tiredness in daily activities during a 3-year intervention period in non-disabled older adults. The design was a controlled 3-year intervention study in 34 Danish municipalities with randomization and intervention at municipality level. The 17 intervention municipality visitors received regular education and general practitioners were introduced to a short assessment program. The effect was measured among old non-disabled individuals living in the municipalities by a validated scale on tiredness in daily activities at baseline and at the end of the intervention period. In total 2,515, 75- and 80-year-old men and women participated in all parts of the present study. Eighty-year-old non-disabled men and women who lived in the control municipalities had larger odds ratios of sustained tiredness during the 3-year intervention period compared with 80-year-olds living in intervention municipalities where both GPs and home visitors participated in the educational programme (OR = 3.48; 95% CI 1.51–8.00) and in intervention municipalities where only the home visitors (OR = 2.63; 95% CI 0.97–7.12) were educated. The intervention had no effect on stability and change in tiredness among the 75-year-old

men and women. A brief, feasible educational intervention for primary care professionals has beneficial effect on changes in feelings of tiredness in non-disabled 80-year-old men and women.

**Keywords** Community intervention · Preventive home visits · Tiredness · Education

### Introduction

In primary prevention, it may be useful to characterize early functional states that are associated with later disability. Recent studies based on data from the Nordic countries have shown that tiredness in daily activities is an indicator of an early stage of disablement. It predicts the onset of functional limitations (Avlund et al. 2004, 2006) and disability (Avlund et al. 2002, 2003), use of social and health services (Avlund et al. 2001) and mortality (Avlund et al. 1998).

Tiredness in non-disabled older adults is a result of multiple potentially modifiable factors, e.g. comorbidity, cognitive decline and depressive mood (Avlund et al. 2007a). Tiredness may thus be seen as a subjective indicator of frailty, defined as a physiologic state of increased vulnerability to stressors that results from decreased physiologic reserves and even dysregulations of multiple physiologic systems (Fried et al. 2004). These decreased reserve capacities include age-related declines in muscle strength in older adults (Rantanen 2003), which are very likely to lead to tiredness as older persons need to use a greater percentage of their reduced maximal strength for daily activities, so that their rate of recovery may be impaired following such tasks (Allman and Rice 2002). However, other age-related declines may also play

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a role for feelings of tiredness, e.g. the age-related declines in the nerve system, the sensory system and in the immunological system (Bennett et al. 1998), or sub-clinical infections, which are regarded as biological responses of the immune system to a number of different stimuli (Ferrucci et al. 2000). In addition, tiredness may reflect the cumulative impact across multiple life domains such as a cumulative negative impact of low social position and/or stressful social relations or lack of social relations throughout the life span (Seeman et al. 2002). Tiredness may then be seen as a kind of chronic reaction to the accumulated chronic strain of dealing with the effects of cumulated social stress throughout life in addition to the physiological and biologic decline that characterizes aging. This fits well with the definition of tiredness in daily activities as a biologic syndrome of decreased reserve capacities and decreased resistance to stressors (Thage 2001), resulting from cumulative declines across multiple physiologic systems, declines that have not yet caused frank disability.

Feelings of tiredness change with time. Studies of changes in tiredness in daily activities with 5-year intervals from age 70 to age 85 showed that rather large proportions reported sustained absence of tiredness up until age 80, and some people also recovered from a period with tiredness. The proportion of persons with sustained absence of tiredness from age 80 to 85 was small and very few recovered from tiredness, while a substantial proportion declined (Avlund 2004). However, it is not known whether it has beneficial effect to intervene on signs of tiredness. In a recent study we analysed whether functional ability in home-dwelling older men and women could be improved by educating the municipality employed preventive home visitors (Vass et al. 2002). The intervention included a 3-year educational programme with focus on relevant gerontological and geriatric problems, especially on the importance of tiredness as an indicator of frailty. Intervention was associated with better functional ability in the older individuals living in the intervention municipalities, especially among those older than 80 years and among the women (Vass et al. 2004, 2005). However, it is not known whether the intervention influenced early signs of disability measured as stability and change in tiredness in daily activities in the older adults living in the study municipalities.

The purpose of the present study was to investigate whether a 3-year educational intervention to preventive home visitors was associated with change in tiredness in daily activities in non-disabled older adults. The analyses were stratified by sex and age, because analyses on the data with other outcomes showed different effects in men and women and in young-old and old-old participants (Vass et al. 2004, 2005; Avlund et al. 2007b).

## Material and methods

The study is based on secondary analyses of a population-based prospective-controlled cohort study with randomization and educational intervention of home visitors and GPs at municipality level and outcome measured among the old persons living in the municipalities with 1½, 3-, and 4½-year follow-up. Detailed information about the study design has been published elsewhere (Vass et al. 2002). The present study is based on data from the baseline and 3-year follow-up study.

### The municipalities

Preventive home visits were twice a year offered to home-dwelling older people in all Danish municipalities according to state law. Of the 81 municipalities in four counties, 50 met the inclusion criteria and were invited to participate in a study aimed at enhancing active life expectancy for older persons living in the municipalities; 34 municipalities agreed to participate. No demographic differences were seen between these and the remaining 16 municipalities. Randomization was carried out following paired matching of intra-county municipalities, urban/rural type, size and geriatric services. The intervention- and control-municipalities were similar with regard to size, rural and urban characteristics and participating persons (Vass et al. 2002).

### Participants

Altogether, 5,788 non-institutionalized citizens living in the 34 municipalities born in 1918 (80 years old) or 1923/1924 (75 years old) were invited. We chose to include the 75-year-olds, because this age group is the youngest to be offered preventive home visits according to the Danish law. We added a sample of 80-year-olds in order to get a sufficient size of the study population and in order to analyse whether effects of the intervention would be different in this more aged group, where it is known that more decline takes place (Avlund 2004). Addresses were drawn from the Civil Registration Office. Written consent was obtained from 4,060 persons (participation rate 70.1%). Twenty-two persons died and four were institutionalized before the intervention started ( $n = 4,034$ ). To select an initially non-disabled cohort, we excluded 1,225 persons reporting need of help at baseline in at least one of the following daily activities: Comb hair, wash upper and lower body, use toilet, dress upper and lower body, take shoes/stockings on/off, cut finger- and toenails ( $n = 2,809$ ). After 3 years 294 persons were lost to follow-up because of death and

non-participation for other reasons ( $n = 2,515$ ). For a further description of the non-participants in all parts of the study see Vass et al. (2007).

Detailed information on use of health and social services of the study participants was continuously registered in specially designed software installed in the municipalities. A number of preventive home visits during the study period were quarterly sent to the research team and transferred into a file that protected study participants from identification. As preventive home visits are performed as part of the Danish law they take place in both control and intervention municipalities. We use number of preventive home visits during 3 years as variable: 0, 1–4, 5+.

**Educational intervention among the health professionals in the municipalities**

The intervention took place during 3 years and included (1) initial interdisciplinary education of all professionals involved in preventive home visits, (2) education of two key persons from each municipality followed up twice a year, (3) small group-based education of the GPs. The main topics of the educational training followed a protocol with focus on relevant gerontological and geriatric problems (see Fig. 1). We encouraged conducting the home visits in a structured way with focus on tiredness in daily activities and physical activity while respecting individual variation, and endeavouring inter-disciplinary coordinated follow-up in the local setting. Control municipalities received no education and conducted the national preventive

programme on preventive home visits in their own way. We use two measures for the intervention:

1. Control (living in the control municipalities) versus intervention (living in the intervention community).
2. Dose of intervention: control, medium dose: only education of home visitors, high dose: education of both home visitors and general practitioners.

**Outcome measures among the old individuals living in the municipalities**

Tiredness in daily activities was measured by the Mob-T Scale (Mobility-Tiredness) (Avlund et al. 1996) at baseline and at 3-year follow-up. The scale was formed by answers to questions about the following six activities: transfer, walk indoors, going outdoors, walk outdoors in nice weather, walk outdoors in poor weather, and climb stairs. The Mob-T Scale describes whether the participants perform the activities with or without tiredness afterwards and counts the number of items performed without tiredness. High scale values describe better function. In the present analyses, the scales are dichotomized into maximum values and values below the maximum score. Reliability tests on the Mob-T Scale showed agreement per cents from 88.9 to 1.0 and kappa values from 0.55 to 0.96 for the included items on intra-rater and inter-rater tests (Avlund et al. 1995). The construct validity of the included items has been tested by the

**Fig. 1** The intervention

**The intervention**

<p><b>The main content of the education given to the key persons</b></p> <ul style="list-style-type: none"> <li>- To emphasise the importance of psychological, social as well as health factors in the assessment</li> <li>- To focus on early signs of disability, especially unexplained tiredness in daily activities. Two easily administered functional ability tests were recommended</li> <li>- To support individual resources and facilitate empowering strategies and social relations with respect to autonomy</li> <li>- To stress the importance of physical activity and stimulate the communities to facilitate participation in physical activities through convenient transportation and sports</li> <li>- To focus on relevant geriatric problems, e.g. prevention of falls, mental problems medication, incontinence, and nutrition</li> <li>- To inform about local services, e.g. garden help, meals on wheels and to refer to other social or health services if relevant</li> <li>- To encourage interdisciplinary follow-up in relation to other social and health professionals at the local level, including the GPs</li> <li>- To practice good communication techniques with older people</li> </ul>
<p><b>The main messages to the GPs were</b></p> <p>Take any encounter caused by a preventive home visits serious              Think twice before you say 'it is age'              Incorporate the five D's in your usual clinical practice              Disease              Depression              Dementia              Drugs              Drinks</p>

Rasch model of item analysis (Avlund et al. 1996). Analyses of criterion-related validity concluded that mobility as measured by the scales was strongly associated with diagnosed diseases (Schultz-Larsen et al. 1992), isometric muscle strength (Avlund et al. 1994), postural balance (Era et al. 1997) and physical performance (Avlund et al. 1994). Change in tiredness from baseline to 3-year follow-up is described in the following four groups: (1) sustained no tiredness, (2) onset of tiredness, (3) recovery from tiredness, (4) sustained tiredness.

#### Covariates

Sex: Living alone measured with a question at baseline: yes/no.

#### Ethics

The regional Ethical Committee involved approved the study.

#### Statistical analysis

The preliminary analyses were stratified by sex and age. All analyses were based on the intention-to-treat principle. The first step in the analysis was to analyse whether the intervention was related to (1) sustained no tiredness (vs. onset of tiredness) and (2) recovery from tiredness (vs. sustained tiredness) at the bivariate level by chi-square tests. These analyses showed the same patterns of associations for men and women but different patterns for the 75- and 80-year-olds. Consequently, the next analyses were stratified by age and adjusted by sex. The second step was to perform crude and multivariate logistic regression analyses with change in tiredness as a dependent variable. The SAS procedure Logistic was used for all logistic regression analyses.

## Results

Table 1 shows the distribution of changes in tiredness in the total study population of 75- and 80-year-old men and women from baseline to the end of the 3-year educational intervention period. The proportions without tiredness were large. About 82%/73% of the 75-year-old men/women did not feel tired in their daily activities at baseline. The corresponding percentages for the 80-year-old men and women were 74 and 64%.

#### Onset of tiredness

Among participants with no tiredness at baseline no associations were seen between living in the intervention municipalities during the three intervention years and sustained absence of tiredness, neither in the 75-year-olds nor in the 80-year-olds (Table 2).

#### Sustained tiredness

In the study population with tiredness at baseline a significantly larger proportion of 80-year-old participants who lived in the control municipalities had sustained tiredness during the intervention period compared with 80-year-old participants living in the intervention municipalities. These associations were not seen in the 75-year-olds.

The multivariate analyses showed that the odds ratio for living in the control municipalities on sustained tiredness was 2.29 (95% CI 1.10–4.76) adjusted for sex, number of preventive home visits and live alone (not shown in table). Table 3 shows the results of the multivariate logistic regression with sustained tiredness during the 3-year intervention period as a dependent variable and a dose of intervention as an independent variable. The results of the adjusted analyses were that 80-year-old persons who lived in the control municipalities had marginally significant higher odds ratios of sustained tiredness compared with

**Table 1** Changes in tiredness from baseline to end of intervention ( $n = 2,515$ )

	75-year-old participants			80-year-old participants		
	Men ( $n = 881$ ) (%)	Women ( $n = 1,031$ ) (%)	<i>P</i>	Men ( $n = 260$ ) (%)	Women ( $n = 343$ ) (%)	<i>P</i>
Tiredness during 3 years						
Not tired–not tired	64	54		53	40	
Not tired–tired	18	19		21	24	
Tired–not tired	6	7		7	7	
Tired–tired	13	19	<0.0001	20	30	0.0071

*P* describes differences between men and women by chi-square tests

**Table 2** Associations between living in the intervention municipalities and stability and change in tiredness during 3 years of follow-up ( $n = 2,515$ )

	75 years			80 years		
	Intervention	Control	P	Intervention	Control	P
Not tired at baseline	$n = 759$	$n = 721$		$n = 229$	$n = 180$	
Not tired–not tired	77%	75%		67%	67%	
Not tired–tired	23%	25%	0.621	33%	33%	0.975
Tired at baseline	$n = 224$	$n = 208$		$n = 94$	$n = 100$	
Tired-not tired	25%	31%		28%	14%	
Tired-tired	75%	69%	0.148	72%	86%	0.019

*P* describes differences between participants in the intervention and the control municipalities by chi-square tests

**Table 3** Odds ratios for sustained tiredness during the 3-year intervention period by dose of intervention in 80-year-old men and women by logistic regression analysis

	Crude	Adjusted
Control	<b>3.17 (1.40–7.14)</b>	<b>3.48 (1.51–8.00)</b>
Medium dose: education of home visitors only	2.00 (0.79–5.12)	2.63 (0.97–7.12)
High dose: education of home visitors and GPs	1.0	1.0
Sex: men vs. women	0.67 (0.33–1.36)	0.72 (0.33–1.57)
Preventive home visits		
0 vs. 5+	3.00 (0.96–9.39)	<b>3.62 (1.08–12.07)</b>
1–4 vs. 5+	2.09 (0.79–5.50)	2.51 (0.91–6.94)
Living alone vs. living with others	1.32 (0.65–2.66)	1.13 (0.52–2.45)

*Bold values* indicate statistically significant odds ratios ( $p < 0.05$ )

their counterparts in the intervention municipalities with medium dose of intervention (only education of home visitors). The odds ratios for sustained tiredness were stronger and statistically significant when living in control municipalities was compared with living in municipalities with high dose of intervention (education of both home visitors and general practitioners).

## Discussion

The main result of this study is that a brief, simple and feasible educational intervention towards preventive home visitors was associated with recovery from tiredness during the 3-year intervention period among 80-year-old men and women.

It is plausible that the educational intervention influenced several factors in the home visitor: motivation, more knowledge about prevention of disability and the multifactorial risk factors of disability in older adults, interest in seeking advice from other health professionals, better communication skills, possibility for network with other home visitors, and more new ideas for health promotion and prevention of disease at the home visits. The present results indicate that the continuing underlining of the importance of tiredness as an early indicator of later disability has been fruitful. We may also argue that the home

visitors have been able to transfer knowledge in a way which ultimately had an effect on older individuals' feelings of tiredness in their daily activities.

It is worth noting that a large proportion of old non-disabled persons manage their daily activities without tiredness during a period of 3 years. The present study shows that it is possible to influence feelings of tiredness in this non-disabled population by a multifaceted intervention directed towards home visitors and general practitioners in the municipalities. There may be several explanations why the effect on tiredness is seen only in the older study participants. Studies based on the Glostrup Aging Studies in Denmark have shown that the proportions with tiredness in daily activities increase with age, but also that relatively large proportions recover from tiredness even in very old age (Avlund 2004). This implies that the 80-year-olds may be closer to the thresholds of becoming tired in their daily activities compared with the 75-year-olds. And thus, it may not be possible to obtain measurable effects of the intervention with this outcome measure until this age.

Tiredness in daily activities has earlier been shown to be strongly related to onset of disability. Crude analyses based on the present study population showed that the onset of tiredness during the three intervention years was significantly related to the onset of disability at 4½-year follow-up (OR = 2.80; 95% CI 1.95–4.02), and, likewise, that sustained tiredness during the three intervention years was

significantly related to onset of disability at 4½ year follow-up (OR = 2.04; 95% CI 1.22–3.46) (not published). This indicates that sustained tiredness and the onset of tiredness may be seen as a first step on the trajectory to disability and underlines the importance of intervening on signs of tiredness.

The educational programme was multifaceted with focus on relevant geriatric and gerontological problems, and with special focus on tiredness in daily activities. It is not known how the effects would have been if the programme had focused exclusively on tiredness as an early sign of frailty. However, this would not be realistic in a study in the real world.

It was not possible to blind the municipalities to the intervention, and the old participants knew that their municipality took part in a project, but not whether they belonged to an intervention or control municipality. However, we observed no overall differences in response rates between intervention and control municipalities (Vass et al. 2002), which supports that most participants were blinded to the intervention. It was, however, impossible to avoid communication between intervention and control municipalities. During the study period county meetings were arranged for home visitors from both intervention and control municipalities with exchange of experiences with preventive home visits (not a part of this study). However, if this has diluted some of the intervention, this would only result in an underestimation of the positive effects of the intervention.

Strengths of the study included the high number of participants, the low drop-out, the feasibility of the intervention owing to the structured guidelines that were easily implemented in regional education and that there were no major home visitor staff differences between intervention and control municipalities. A low drop-out rate was achieved through vigorous follow-up and high motivation among all participating municipalities. It is also a strength of the study that the analyses are based on a well-validated measure of tiredness in daily activities (The Mob-T Scale). The scale has been successfully tested for construct validity (Avlund et al. 1996), criterion-related validity (Schultz-Larsen et al. 1992), reliability (Avlund et al. 1995) and predictive validity (Avlund et al. 1998, 2001, 2002, 2003, 2004, 2006). The scale is able to distinguish between different levels of function among the non-disabled older adults (Avlund and Holstein 1998) and suitable at measuring change among non-disabled older adults (Avlund 2004). Thus, this scale is more sensitive than other measures with regard to early declines among well-functioning older people.

In conclusion, a brief, feasible educational intervention for primary health care professionals is related to recovery

from feelings of tiredness in daily activities in non-disabled 80-year-old individuals.

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