Promoting physical activity in older adults by education of home visitors

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Abstract The objectives were to investigate in older adults (1) whether regular preventive home visits are associated with change or stability in physical activity and (2) whether education of home visitors influences stability and change in physical activity. The design was a prospective controlled randomised follow-up study with randomization at municipality level (17 intervention and 17 control municipalities) and outcomes measured at individual level. Visitors in the intervention-municipalities received regular education during 3 years. The effect of the intervention was measured by a questionnaire survey among 1,913 old persons living in the 34 municipalities at baseline and 4½-year follow-up. Changes in physical activity were measured through self-reported frequencies of vigorous physical activity. All logistic regression analyses were stratified by sex and age group (75 and 80 years old). There was no effect of receiving preventive home visits on change in physical activity among the men and among the 75-year-old women. Among the physically active 80-year-old women those who accepted and received more than four preventive home visits were more likely to go on being physically active compared to women who did not receive preventive home visits. Among the sedentary 80-year-old women those living in the intervention municipalities tended to increase their physical activity compared to the

control women. These results were not seen in the old men. Preventive home visits as part of daily routine in primary care and education of home visitors and general practitioners may promote physical activity in older women.

Keywords Educational intervention · Preventive home visits · Change in physical activity

Introduction

There is strong evidence linking physical activity to numerous health improvements (Physical Activity and Health 1996). Physical activity may be defined as bodily movement produced by the concentration of skeletal muscle that increases energy expenditure above the basal level, but in order to be of benefit for health-related fitness physical activity must include training of cardio-respiratory fitness, muscular strength and endurance, body composition and flexibility (Physical Activity and Health 1996). It is well known that a sedentary life style is an important risk factor both for several diseases and for the consequences of diseases in old age (Singh 2002), but also that lack of physical activity is one of the most important independent risk factors for onset of disability in older adults (Brach et al. 2003; Schroll 2003; Stuck et al. 1999). It is therefore of interest to identify factors of importance for promoting a sustained or increased physical activity in old age and to know whether it is possible to promote physical activity by general intervention programmes in older populations.

As part of national policy in Denmark municipalities have been obliged to offer two annual home visits to persons age 75 and older since 1996. Several randomized controlled trials have shown that preventive home visits to older people have beneficial effects on mortality

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(Hendriksen et al. 1984; Elkan et al. 2001; Stuck et al. 2002), hospital admissions (Hendriksen et al. 1984; Stuck et al. 1995, 2002) and functional ability (Stuck et al. 1995, 2000, 2002). In agreement with these results preventive home visits are carried out with multidimensional focus including physical, mental as well as health dimensions. It is, however, not known whether it is possible to promote changes in physical activity by these preventive home visits when offered as part of the daily routine in primary care.

In a recent randomised intervention study we found improved functional ability in older adults living in municipalities where the preventive home visitor staff received education on how to perform the preventive home visits in the best way (Vass et al. 2002). The educational intervention had a broad focus, which also included promotion of physical activity at municipality level as well as at the individual level. Overall measurable effects of home visitor education on functional ability were especially seen among the women (Vass et al. 2004; Avlund et al. 2007a) and in the oldest (Vass et al. 2005). It is not known whether education of home visitors has any effect on stability and changes in physical activity in older persons.

The aims of the present study were to investigate (1) whether regular preventive home visits were associated with change or stability in physical activity in the older adults living in the municipalities and (2) whether education of home visitors in the municipalities influenced stability and change in physical activity among older men and women. The analyses will be stratified by gender and age, because it has been shown that the effects of the intervention on other outcomes differed by age and gender (Vass et al. 2004, 2005; Avlund et al. 2007a).

Materials 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 the 4½-year follow-up study. The statistical power calculation indicated a need for at least 15 communities in each group (intervention and control) and, if at all possible, at least 100 persons in each community (Vass et al. 2002).

The municipalities

The inclusion criteria for the municipalities were that (1) they should offer preventive home visits as prescribed by

law, (2) it should be possible for the GPs to perform preventive health checks and preventive home visits as part of the GP contract and (3) structural facilitation of good rehabilitation should be present. Fifty of 81 municipalities in four counties met these criteria and were invited; 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).

Intervention

The intervention took place during 3 years and included (1) initial interdisciplinary education and training of all professionals involved in preventive home visits, (2) education of two key persons from each municipality followed up twice a year, and (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. We encouraged conducting the home visits in a structured way with focus on tiredness in daily activities and physical activity. Tiredness in daily activities in the visited old people may be interpreted as an early sign of disability (Avlund et al. 2003; Avlund 2004) and the visitors were asked to search for the reasons for such tiredness in health, mental or social domains (Avlund et al. 2007b). The home visitors were recommended to map possibilities for physical activity in the communities, to update information about transportation for physical training and to offer individualised training and management plans to the hale and hearty as well as to the disabled participants. We encouraged an interdisciplinary approach. District nurses, physical and occupational therapists, home helpers and social workers were urged to work together and use each other's expertise in following up on the preventive home visits. Intervention towards individualised counselling was given the highest priority both as more general health promotion to all participants and in rehabilitation situations. All educational sessions tried to focus on different rehabilitative strategies with respect to different clinical situations: e.g., how to exercise with osteoarthritis of the hip at home, how to arrange to join group training in heated basins with instructors, how to exercise with congestive heart failure or chronic obstructive lung disease, etc. At every educational session with the preventive home visitors these topics, "tiredness in daily activities" and "physical activity" were thoroughly followed up with recent

education on scientific results from the teachers' own research and related well-documented research. Implementation was reinforced asking every municipality to report status on how they managed to disseminate these 'messages' into routine care. In 9 of the 17 intervention municipalities local general practitioners in the beginning of the study period also accepted and participated in a small-group-based 2-h educational session. The GPs were urged to *avoid ageism* and take any encounter caused by a preventive home visit seriously. GPs were encouraged to incorporate a short geriatric assessment (the mnemonic-five D's: *Delirium, Depression, Dementia, Drugs, Drinks*) in his/her usual clinical practice (Vass et al. 2005).

Control municipalities received no education and conducted the national preventive program on preventive home visits in their own way.

We used dose of intervention as main variable: control, only education of municipality home visitors, education of both home visitors and general practitioners working in the intervention municipalities.

Study population

The effects of the intervention were measured by a questionnaire among the old citizens living in the 34 Danish municipalities. The baseline study in 1998 included all non-institutionalised citizens born in 1918 (80 years old) and 1923/1924 (74–75 years old) ($n = 4,060$) (Vass et al. 2002). For a further description of the study population, see Avlund et al. (2007a). We excluded 128 participants who had not answered the question about vigorous physical activity ($n = 3,932$). At 4½-year follow-up 1,913 of the surviving participants answered the questions on physical activity and thus constitute the study population for the present analyses. The data were collected by questionnaires at baseline and 4½-year follow-up. A baseline comparison of the 1,913 participants and the 2,147 non-participants in the present study showed that a significantly higher proportion of the participants had better functional ability and stronger social relations compared to the non-participants ($P < 0.0001$ for all comparisons). The study is thus based on a selected population of well-functioning older adults.

Since 1998 all Danish municipalities have been required by law to offer two annual preventive home visits to all citizens aged 75 years or older. Their main purpose is to support personal resources and networking and to offer social support aimed at preserving functional ability. How to organize and carry out the program is at the discretion of each municipality, which receives no detailed guidelines. This is in agreement with the Danish policy of decentralisation. Visits are primarily carried out by district nurses or physiotherapists/occupational

therapists. National evaluations report that about 60% of those aged 75 years and older accept and receive the preventive home visits, not necessarily two times per year. This means that many municipalities did not fulfil the law.

Detailed information on use of health and social services of the study participants was continuously registered in specially designed software installed in the municipalities. This includes information about persons who accepted the offer and received preventive home visits. 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+.

Outcome measure

The measure of physical activity was developed especially for use among community-dwelling older adults (Holst and Holstein 1990). Levels of physical activity were classified by self-report, which is practical for assessing physical activity in large populations because they are not costly, are relatively easy to administer, and are generally acceptable to study participants (LaPorte et al. 1985). Self-report measures of physical activity have been validated against cardio-respiratory fitness and the overall tendency has shown moderate external validity (Physical Activity and Health 1996). Vigorous physical activity was measured by the question "Do you practice any form of vigorous physical activity: e.g., sports, gymnastics, dance, long bicycle rides, long walks, heavy garden work?": never, rarely (not every month), once or twice per month, several times per month and several times per week. We distinguished persons with vigorous physical activity several times per month (high) and persons who practised vigorous physical activity more seldom (low). Persons with vigorous physical activity several times per month had a physical activity level close to the recommendations from the American College of Sports and the Danish National Board of Health—30 min of physical activity a day (Physical Activity and Health 1996; Pedersen and Saltin 2003). Patterns of changes in vigorous physical activity were analysed by information of vigorous physical activity at baseline and 4½-year follow-up (Elkjaer et al. 2006). The analyses were carried out for two outcomes—decline in vigorous physical activity versus sustained high level of vigorous physical activity (from high to low) from baseline to 4½ years later and sustained low physical activity versus

improvement in physical activity (from low to high) from baseline to 4½ years later.

Covariates

Mobility–disability was measured by the Mob–H Scale (Mobility–Help). We asked whether the participants were in need of help to transfer, walk indoors, go outdoors, walk outdoors in nice weather, walk outdoors in poor weather, and climb stairs (Avlund et al. 1996). The scale counts the number of items managed without help. High scale values thus describe better function. Reliability tests on the Mob–H Scale showed that agreement percents were 1.0 and kappa values from 0.82 to 1.0 for the included items on intra-rater and inter-rater tests (Avlund et al. 1995). *Tiredness in mobility activities* was measured by the Mob–T Scale (Mobility–Tiredness) which includes the same six mobility activities. We asked whether the participant felt tired after performing the activities. The scale counts the number of items where the participants reported no tiredness. High scale score thus describes better function. Reliability tests showed agreement percents from 92.2 to 1.0 and kappa values from 0.66 to 0.96 for the included items on intra-rater and inter-rater tests (Avlund et al. 1995). The coding of the postal questionnaires was performed by two occupational therapists who used a code precept and regular meetings were held where the coding of the questions was discussed and standardized. In the present analyses both scales were dichotomised into maximum levels and levels below maximum score. The construct validity of both scales has been successfully tested by the 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), physical performance (Avlund et al. 1994) and postural balance (Era et al. 1997). Changes in disability from baseline to 4½-year follow-up are described in the following four groups on the two scales: (1) sustained good, (2) deterioration, (3) improvement and (4) sustained poor.

Measures of social relations were included as covariates because it is well-known that social relations are related to physical activity and other health behaviours (Seeman 2000). It is thus also possible that the level of social relations may influence whether older persons choose to receive preventive home visits. Social relations were measured at baseline as: *Diversity in social relations* measured as number of categories with which the participants have personal contact at least once a month: children, grandchildren/great-grandchildren, siblings, other relatives, friends/acquaintances (range 0–5). We distinguished persons with high

diversity in social relations (4–5) and persons with low (0–3). *Social participation* was measured by three items about (1) paying monthly visits to others, (2) receiving monthly visits at home, and (3) participating in monthly social activities outside the home (range 0–3). We differed between low social (0–1) and high social participation (2–3 points). A test–retest study of the included items of social relations showed agreement percents between 72 and 100 and kappa values between 0.50 and 1.0 (Due et al. 1999). Further, in-depth interviews demonstrated high face and content validity of the social relations measures used (Due et al. 1999).

Ethics

The regional Ethical Committee involved approved the study.

Statistical design considerations

All analyses were stratified by sex and age. The first step in the analysis was to test whether the independent variables were related to (1) decline in physical activity (vs. sustained high physical activity) and (2) sustained low vigorous physical activity (vs. increase in physical activity) at the bivariate level by Chi-square tests. The variables found to be individually related to one of the outcome measures of physical activity ($P < 0.20$) were then incorporated as independent variable in the logistic regression analyses. The following factors were entered in the regression model: (1) age and sex, (2) changes in tiredness in daily activities, (3) changes in need of help in daily activities, and (4) social relations at baseline. The final model includes the variables which attenuated the association between the independent variables and changes in physical activity more than 20%.

Results

At baseline 76/77% of the women/men were 75 years old while the remaining participants were 80 years old at baseline. Table 1 shows a large variety of patterns of changes in vigorous physical activity from baseline to 4½-year follow-up with large gender differences. Significantly more men than women in both age groups had sustained high levels of physical activity, whereas significantly more women than men had sustained low levels of physical activity during 4½-year follow-up.

Table 2 shows the distribution of the main independent variables among the study participants. There were no

Table 1 Changes and stability in physical activity in 75- and 80-year old men and women during 4½ years

Physical activity Baseline—4½ years	75 years			80 years		
	Men (n = 678) (%)	Women (n = 782) (%)	<i>P</i>	Men (n = 200) (%)	Women (n = 253) (%)	<i>P</i>
High–high	44	35		34	21	
High–low	18	16		22	20	
Low–high	9	9		9	6	
Low–low	30	41	0.0001	36	54	0.0008

P Chi-square test for differences between men and women

Table 2 Distribution of the main independent variables among 75- and 80-year-old men and women

	75 years			80 years		
	Men (n = 678) (%)	Women (n = 782) (%)	<i>P</i>	Men (n = 200) (%)	Women (n = 253) (%)	<i>P</i>
Intervention dose						
Control	46	52		44	43	
Education only of home visitors	27	25		30	32	
Education of home visitors and GPs	27	23	0.169	26	25	0.896
Number of home visits						
0	42	34		32	37	
1–4	51	59		51	52	
5+	7	8	0.004	18	11	0.086

P values describes differences between men and women by Chi-square tests

gender differences with regard to the intervention, whereas larger proportions of the women had received preventive home visits compared to the men.

Decline in physical activity

Among the 75-year-old men and women there were no effects of the intervention and of preventive home visits on decline in physical activity (Table 3). In the 80-year olds patterns for associations between number of home visits and decline in physical activity went in opposite directions for men and women (Table 3). The crude logistic regression analysis shows that men who received more than four home visits had larger odds ratios of declining physical activity during 4½ years compared to men who received only 1–4 home visits (OR = 3.01; 95% CI: 1.02–8.85). However, the estimate was attenuated when adjusted by the intervention and by functional ability (OR = 2.81; 95% CI: 0.81–9.86) (Not shown in table). Among the 80-year-old women a marginally significant larger amount who had received no home visits had more decline in their physical activities compared to women who had received more than one home visits during the three intervention years. Table 4 shows the odds ratios for the intervention and number of

preventive home visits on decline in physical activity for the 80-year-old women based on multivariate logistic regression analysis. Concurrent changes in need of help in mobility activities (measured by the Mob–H Scale) did not attenuate the estimates. Consequently these variables were not included in the final models. The results of the final adjusted logistic regression analysis show that 80-year-old women who did not receive preventive home visits were at significantly larger risk of declining in their physical activities compared to women who received 1–4 home visits. The intervention had no effect on decline in physical activity.

Increase in physical activity

Among the 75-year-old men and women and among the 80-year-old men there were no effects of the intervention and number of preventive home visits on increased physical activity (Table 3). However, there was a tendency to a marginally significant association between living in the intervention municipalities and increased physical activity during 4½ years among the 80-year-old women. A Cochran's test for linear trend showed a significant trend ($P = 0.041$). The crude logistic regression analyses

Table 3 Bivariate associations between covariates and changes in vigorous physical activity during 4½ years

	Men								Women							
	High vigorous physical activity at baseline				Low vigorous physical activity at baseline				High vigorous physical activity at baseline				Low vigorous physical activity at baseline			
	N	Sustained high (%)	Decline (%)	p ¹	N	Increased (%)	Sustained low (%)	p ²	N	Sustained high (%)	Decline (%)	p ¹	N	Increased (%)	Sustained low (%)	p ²
75 years																
Intervention dose																
Control	204	70	30		110	20	80		192	69	31		213	17	83	
Only home visitors	115	70	30		68	26	74		96	68	32		99	16	84	
Visitors and GPs	98	74	26	0.674	83	24	76	0.583	104	70	30	0.929	78	21	79	0.716
Number of home visits																
0	186	74	26		96	20	80		133	74	26		129	12	88	
1–4	203	69	31		144	27	73		229	67	33		231	20	80	
4+	28	61	39	0.273	21	10	90	0.131	30	60	40	0.176	30	17	83	0.162
80 years																
Intervention dose																
Control	47	64	36		41	20	80		37	41	59		73	5	95	
Only home visitors	35	54	46		25	20	80		37	57	43		44	11	89	
Visitors and GPs	29	66	34	0.586	23	17	83	0.970	29	55	45	0.317	33	18	82	0.122
Number of home visits																
0	37	70	30		26	15	85		37	35	65		57	12	88	
1–4	55	64	36		47	21	79		52	60	40		80	6	94	
4+	19	37	63	0.046	16	19	81	0.828	14	57	43	0.065	13	23	77	0.132
p ¹ describes differences between sustained high and decline in physical activity by Chi-square tests																
p ² describes differences between increased and sustained low physical activity by Chi-square tests																

p¹ describes differences between sustained high and decline in physical activity by Chi-square testsp² describes differences between increased and sustained low physical activity by Chi-square tests

Table 4 Odds ratios for the intervention and preventive home visits on decline in physical activity

	Crude OR (95% CI)	Final adjusted model OR (95% CI)
Dose of intervention		
Control	1.81 (0.68–4.82)	1.53 (0.42–5.60)
Education only of home visitors	0.94 (0.35–2.50)	1.07 (0.31–3.68)
Education of home visitors and GPs	1.0	1.0
Number of preventive home visits		
0	2.73 (1.14–6.53)	2.59 (1.01–6.63)
1–4	1.0	1.0
5+	1.11 (0.34–3.66)	1.16 (0.32–4.22)

Women 80 years old at baseline. Adjusted by concurrent changes in mobility–tiredness, diversity in social relations and social participation

demonstrated that the odds ratio for 80-year-old women living in the control municipalities on sustained low physical activity was 3.83 (1.00–14.66) compared to women living in intervention municipalities where both home visitors and general practitioners had received the educational intervention. Table 5 the estimate became even stronger in the adjusted analyses (OR = 4.53, 95% CI: 1.04–19.73). However, the confidence intervals are very wide. Concurrent changes in need of help in mobility activities (measured by the Mob–H Scale) did not attenuate the estimates. Consequently these variables were not included in the final models. Number of regular preventive home visits was not related to increase in physical activity.

Table 5 Odds ratios for the intervention and preventive home visits on sustained low physical activity

	Crude OR (95% CI)	Final adjusted model OR (95% CI)
Dose of intervention		
Control	3.83 (1.00–14.66)	4.53 (1.04–19.73)
Education only of home visitors	1.73 (0.48–6.26)	2.04 (0.52–8.01)
Education of home visitors and GPs	1.0	1.0
Number of preventive home visits		
0	0.48 (0.14–1.58)	0.47 (0.13–1.64)
1–4	1.0	1.0
5+	0.22 (0.05–1.08)	0.19 (0.03–1.02)

Women 80 years old at baseline. Adjusted by concurrent changes in mobility–tiredness, diversity in social relations and social participation

Discussion

The main results were (1) that stability and change in physical activity in 80-year-old women may be influenced by receiving more than four home visits and by an educational intervention for home visitors and general practitioners and (2) that there is no effect of preventive home visits and an educational program for home visitors on stability and change in physical activity among the older men and among 75-year-old women.

The patterns of effects in the 80-year-old women were different among those who were sedentary and those who were physically active at baseline. Among the physically active women those who received more than four preventive home visits during 3 years were more likely to go on being physically active compared to women who did not receive the preventive home visits. This indicates that promotion of physical activity may be part of a general health prevention scheme among all the home visitors, independent on the specific educational program and that this health promotion actually may have had an effect among those who are already active. It is not surprising that older physically active women had benefits from the home visits. The role of the home visitor was to support what the older active women are already doing. The home visitor did not have to promote a change in health behaviour. Furthermore these women already knew the benefits of being physically active and will listen to advice about how to go on—and have the strength to do it.

Among the sedentary 80-year olds the findings indicate that women living in the intervention municipalities might be more likely to increase their physical activity during 4½ years compared to women living in the control municipalities. It is plausible that older women who were physically inactive at baseline has benefited from the educational intervention, because the education of the home visitors included specific advice on physical activities in the municipalities. We specifically advised the home visitors to map possibilities for training, to update information about transportation and to pass this on to the older persons in the municipalities. Older inactive persons need more information and support to take up exercise and it seems that we have succeeded with this by our educational intervention.

In spite of the findings among the 80-year-old women it is important to point out that the educational intervention and the preventive home visits had no effects on changes in physical activity in the men and in the 75-year-old women. First, it is possible that dose of the specific physical activity intervention has been too weak. The preventive home visits include a multidimensional assessment about, e.g., the activities of daily living, social relations, health and mobility and did not only have focus on physical activity. It is plausible that a preventive programme with more

specific focus on physical activity would have more pronounced effects. Second, it is possible that the measure of preventive home visits is too crude, e.g., that we might have seen an effect from preventive home visits when the home visitor used good communication skills and was able to build a good relation. A Swiss study showed that the effect of the preventive home visits on the functional ability of the older persons depended on the actual home visitor (Stuck et al. 2000). However, when we included a variable which combined information about these factors we still only found effect among the 80-year-old women (not shown in table).

There may be several explanations why the effect on stability on change in physical activity only was seen in the 80-year-old women. The proportions with sustained low physical activity and with a decrease in physical activity during 4½ years were largest among the oldest participants. This implies that there are larger possibilities for intervening in the 80+ year olds and that the pieces of advice actually are more likely to make a measurable difference in the oldest participants. An additional explanation could be that the inputs of health promotion have been going on for longer time in the 80-year olds. According to Danish law preventive home visits are offered to all citizens age 75 and older. This of course implies that the 80-year olds have had preventive home visits for more years compared to the 75-year olds. The 80-year olds have also experienced more disability in age-peers which may be a further motivational factor for keeping up their physical activity.

It may seem surprising that the educational intervention and the context of the preventive home visits were similar for all participants but that the impact on physical activity was different in men and women. In fact the effects of receiving preventive home visits on physical activity tended to go in opposite directions for men and women, i.e., men who received many visits tended to have larger odds of decline in physical activity compared to men who received fewer home visits. This may be caused by gender differences in reasons for accepting and receiving preventive home visits, i.e., recent results have shown that older men who received preventive home visits were more mentally and physically frail compared to men who did not receive the visits (Avlund et al. 2007c). In addition gender differences in the findings may have several other explanations, some of which may be specific to the Danish society: (1) Women may need more encouragement to exercise and to do other health behaviours compared to men, because they have poorer efficacy expectations with regard to physical activity than men (Clark 1999) and tend to exercise because they know it is important for their health, while men tend to exercise for pleasure (Malterud et al. 2001). (2) Females may be more aware of healthy

behaviours throughout life because of a more continuous contact with the preventive and health services caused by pregnancies and child births (Albizu-Garcia et al. 2001; Verbrugge 1985). Since 1937 a very successful home visiting practice of public health nurses to maternal–child clients has developed in Denmark. It is possible that this explains why the present findings of gender differences have not been seen before. A couple of Danish studies has confirmed that women are more aware of local activities, more likely to try to eat less fat and to try to do more exercises (Osler and Jespersen 1993) and that older women were more likely than older men to increase their physical activity level (Schultz-Larsen 1993). (3) It is possible that the present health promotion unintentionally has been more targeted to older women than to older men. Almost all the preventive home visitors were women. This may also contribute to more “female” ideas for physical activities, which may be more motivating for women than for men. This may have been the case both with regard to (a) the regular ongoing preventive home visits in the municipalities, (b) the educational intervention and (c) the possibilities for physical activity in the municipalities.

Some methodological aspects should be considered in the interpretation of our results. We deal with a healthy participant effect: baseline participants had better functional ability than non-participants, and loss to follow-up was smallest among those with good functional ability. However, there is no reason to believe that the associations found would be systematically different in non-participants compared to participants. It is more plausible that the estimates would have been stronger without the attrition to follow-up, especially in the analyses among persons who were sedentary at baseline.

Physical activity can be investigated in several ways. The used measure of physical activity is based on a single questionnaire item, which defines physical activity as practising vigorous physical activity several times per months. Unfortunately the data set does not include questions which more accurately resemble the recommendations of at least 30 min of endurance-type physical activity on most days of the week (Physical Activity and Health 1996; Pedersen and Saltin 2003).

We used a global question about physical activity with specific examples of physical activity and with broad answering categories. It may be questioned if this gives a reliable picture of the physical activity of the older adults. Of particular concern is how well self-reported physical activity accurately represents a person’s habitual activity status. Factors that interfere with obtaining accurate assessments include incomplete recall, exaggeration of amount of activity and non-representative sampling of time intervals during which activity is assessed (Physical Activity and Health 1996). Also, some older people may

practice different kinds of physical activity, which are not mentioned in the questions. Further, the answers do not give information about the type of activity, e.g., strength or aerobic training, and about the more exact dose of activity. It might have given a more differentiated picture of the habits of physical activities in older men and women if we had asked separate questions about specific physical activities, about the type of activity and with more precise categories of dose of physical activity. Another possibility could have been to measure their present fitness in different types of tests, e.g., Timed Up & Go (Podsiadlo and Richardson 1991). It is strength of the study that the analyses included well-validated measures of tiredness in daily activities, actual disability and of social relations (Avlund et al. 1996; Due et al. 1999).

The results of different effects on change in physical activity suggest that different approaches may be appropriate with respect to much more individualised eligibility than earlier thought of. Since sedentary persons may benefit of intervention at municipality level one could speculate whether more group-based interventions (Dapp et al. 2005) may influence behaviour rather than individualised counselling to older people with different motivational or personal characteristics. This could be organized by the municipality, and include for example free balance training places with funny and easy sport games as a possibility to socialise without personal embarrassment. On the other hand, the fit and motivated may benefit much more of the individualised interventions, which may sustain their resources to stay fit or join rehabilitative offers more than they would have done with preventive home assessments.

Since effects are seen most predominantly in the older group of women other preventive strategies for the ‘younger old’ and for the men may facilitate future ways of preventive strategies to optimise health, wellbeing, and functional status of older people.

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