

Positive effects on life satisfaction following health-promoting interventions for frail older adults: a randomized controlled study

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Abstract

Life satisfaction among older adults is known to decrease over time and with deteriorated health. The aim of this study was to analyze the effects of the health-promoting intervention study *Elderly Persons in the Risk Zone* on life satisfaction. A randomized, three-armed, single-blind, and controlled trial with follow-ups at 3 months, 1 and 2 years. A total of 459 community-dwelling persons at risk of frailty, 80-years or older were included. The participants were independent of help from others in ADL and cognitively intact. The two interventions were i) four weekly multi-professional senior group meetings including a follow-up home visit or ii) one preventive home visit. Life satisfaction was measured with eight questions from LiSat-11. Analyses were made in accordance with the intention-to-treat principle. Life satisfaction decreased over time, with a lower decrease in the intervention groups than in the control group. The proportion of satisfied persons was significantly higher in the intervention group of senior group meetings compared to the control group for five of the eight life satisfaction variables at one year and for all variables at the two-year follow-up. For preventive home visits, there was a significant difference compared to the control group at the one-year follow-up for three of the life satisfaction variables, and at the two-year follow-up for seven variables. We can conclude that a health-promoting intervention can delay the decline in life satisfaction among older adults (aged 80 or older) who are at risk of becoming frail.

Introduction

Increasing age often implies increasing frailty, and the oldest old are often described as a frail group. Frail older adults run a high risk of developing chronic disease, multi-morbidity and functional impairments, which in many cases lead to dependence in daily activities.¹⁻⁵ Frailty is a geriatric syndrome due to the multi-system deterioration in reserve capacity at advanced ages.⁶ Mobility, balance, muscle strength, motor processing, cognition, nutrition, endurance and physical activity are the most frequently included characteristics of frailty.¹

Health-promoting intervention programmes could prevent and delay frailty and functional decline, and those who probably benefit the most from such interventions are people who have not yet suffered any restriction in activity levels or those in early stages of activity restrictions.⁶⁻⁸ Programmes targeting frail older adults need diverse professionals to be able to offer a broad spectrum of intervention components to carry out an effective programme.⁹ Group education and counselling for older adults have been shown to be advantageous in maintaining independent living.¹⁰

In 2008, the three-armed health-promoting intervention study, *Elderly Persons in the Risk Zone* was set up, addressing the very old (age 80+) persons that are on the point of developing frailty, pre-frail.¹¹ The study evaluates the effects of two interventions: i) a preventive home visit and, ii) multi-professional senior group meetings with one follow-up visit. The effects have thus far proven to be positive: there was a postponement in dependence in activities of daily living for the participants in the senior meetings and both interventions delayed the deterioration in self-rated health at the three-month follow-up.¹² There were significant differences in favor of the senior meetings in postponing dependence in activities of daily living (ADL) at the 1 year follow-up and in reducing dependence in three or more ADL at the 2 year follow up and for the preventive home visit in reducing dependence in two or more ADL at the 1 year follow-up.¹³

Even if it is possible to delay the onset of frailty, most older adults will eventually become frail. Consequently the goal cannot always be to maintain or regain full health. Instead the aim can be to increase well-being by minimizing the effects of frailty and deteriorating health. Other aspects are as important for the well-being of the individual, such as life satisfaction. Life satisfaction is the cognitive-judgmental aspect of subjective well-being.¹⁴ It can be based on affective and rational aspects of life, as rated by the individual.¹⁵ In rehabilitation research it has been described as the ability to reach individual goals.¹⁶ Older adults'

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life satisfaction has been shown to decline over time.¹⁷

Life satisfaction is associated with, for example, health (self-rated health more than health status), self-esteem, worry, social relations, social network quality, sense of being in control of one's life and depressive symptoms.¹⁷⁻²⁰ Social relations and social networking are other factors associated with life satisfaction,^{19,20} and being satisfied with social contacts may buffer the dissatisfaction due to reduced functional ability.¹⁷ Participation in physical activities is also associated with life satisfaction, and the consequences of reduced capacity in ADL must be taken into consideration when aiming at improving life satisfaction.¹⁷ Aspects of social relations, continuity, self-determination and use of the individual's own resources are associated with everyday life satisfaction among disabled 85-year old people.²¹

The aim of this study was to analyze the

effects of *Elderly Persons in the Risk Zone* on life satisfaction up to and including two years post intervention.

Materials and Methods

Study design

Elderly Persons in the Risk Zone was a randomized single blind study with three study arms, two intervention groups and one control group, designed to test the hypotheses i) it is possible to prevent/delay deterioration if an intervention is made when the older adults are not so frail, and ii) a multi-dimensional and multi-professional intervention is more effective than preventive home visits alone. All groups were followed-up at three months, one year and two years. Ethical approval was obtained for the study (*Elderly persons in the risk zone* ref.nr: 650-07, Regional Ethical Review Board in Gothenburg). Written informed consent was obtained from all participants. The study was performed between November 2007 and May 2011, and has been described in detail elsewhere.¹¹ The study adheres to the CONSORT statement to report randomized controlled and pragmatic trials.^{22,23}

Participants and settings

The study group comprised of a representative sample of pre-frail persons 80+ still living at home. Persons living in two municipalities of Gothenburg, Sweden were drawn from official registers, and equal numbers from the two municipalities were listed in random order. The inclusion lasted until the intended sample size was reached. The criteria for inclusion were age 80 or older, living in ordinary housing, not dependent on the municipal home help service or care, independent of help from another person in activities of daily living and being cognitively intact (having a score of 25 or higher as assessed with the Mini Mental State Examination).

All data collection was performed in the participant's home. The research assistants were registered nurses, occupational therapists or physiotherapists. They were trained in how to administer the assessments and inter-rater reliability was tested. Study protocol meetings for research assistants were held throughout the study to enhance the quality of outcome measurements.¹¹

Sample size, randomization and blinding

A power calculation was made based on the assumption that the control group would further deteriorate by 20%, and the intervention group *preventive home visit* 15% more than the intervention group *senior meetings*. With a sig-

nificance level of $\alpha=0.05$ and a power of 80%, at least 112 persons were required in each intervention group and 72 in the control group (two-sided test), giving a required total sample of 300; 459 persons were included in the study. The study participants were consecutively randomly assigned to one of the three study arms by the use of opaque sealed envelopes. The enrolment and allocation is described in detail in the study protocol.¹¹ Those administering the interventions and those assessing the outcomes were blind to group assignment.

Interventions and controls

The intervention *senior meetings and a follow-up home visit* included 4 weekly educational senior meetings with about 6 participants/group. The main focus of the meetings was to inform about and discuss the ageing process and its consequences, and to encourage an active lifestyle. In addition, there was social interaction between the participants. Two to three weeks after the last senior meeting there was a follow-up home visit. The group meetings were led either by a nurse, an occupational therapist, a physiotherapist or a social worker, who jointly planned and carried out the intervention with each having responsibility for their specific part of the education. A booklet especially designed for the study group was used as a basis for the meetings. The book includes texts referring to the topics discussed at each meeting, such as the aging process, physical activity, nutrition, self management of health complaints, medication, how to deal with the consequences of aging and keep an active lifestyle.²⁴

The intervention *Preventive home visit* was a single home visit made by either a registered occupational therapist, physical therapist, nurse or a social worker. During the visit, the participants received verbal and written information/advice about what the municipality could provide. They were informed about different service organizations and where support was available in the municipality, and what the municipality provides in the form of local meeting places, activities run by local associations, physical training for seniors, walking groups, possibilities of offering or accepting help on a voluntary basis. In addition, identification of fall risks and advice on how to prevent falls was included in the home visit.

The control group had access to the ordinary range of services if requested from the municipal care for the aged. When an older adult in Sweden can no longer manage independently, she or he can apply for assistance from the municipal home-help services, in order to be able to remain living in their own home. This assistance includes meals-on-wheels; help with cleaning and shopping; assistance with personal hygiene; safety alarms as well as transporta-

tion services. Health care is provided by the primary health care service, or if the older adult is not able to go to the primary health care clinic they can receive medical care supplied by the municipality in their homes. If the research assistant discovered that a person in the control group had any kind of need, he/she was informed about where to turn.

Outcome measures

The primary outcome measure for this study was life satisfaction measured with the Fugl-Meyers Life Satisfaction Assessment (LiSat-11), consisting of eleven items.²⁵ The first item is a global question on satisfaction with life as a whole. The other ten items concern satisfaction with different domains in life: vocational situation, financial situation, leisure time, contacts with friends, sex life, ADL, family life, partnership relation, somatic health and psychological health. The participants are asked to estimate to what extent they experienced satisfaction within each item by choosing from a six-grade scale ranging from very dissatisfied to very satisfied. The instrument has been validated for Swedish adults (men and women aged 18-74 years), and has adequate test-retest, discriminate and specificity validities.¹⁶ There were too many missing answers for the items concerning sexual life, family life and partnership relations, due to many being widows/widowers. These three items were consequently not included in the analysis for this study, giving a total of eight items. In the analysis, the six-graded scale was dichotomized to being satisfied (very satisfied, satisfied and rather satisfied) or not being satisfied (very dissatisfied, dissatisfied and rather dissatisfied).

Statistical analysis

All analyses were conducted on the basis of the intention-to-treat principle.²⁶ Given the old age of the participants, a relatively high drop-out rate was inevitable. Thus, this has to be handled before analyzing the data. Simply analyzing complete cases is not relevant and might lead to bias, especially since missing data were not at random and unevenly distributed between the groups.²⁷ The approach of data imputation in this paper was for the replacement of missing values with a value based on the median change of deterioration between baseline and follow-up of all who participated at follow-up. The reason for this imputation method is threefold: i) the study sample (older adults aged 80 and over) is expected to deteriorate over time as a natural course of the aging process; ii) reasons for not fulfilling the follow-ups were often deteriorated health and iii) the drop-outs being worse off than participants (drop-outs having worse self-rated health at previous interview, higher proportion receiving municipal home help services and having a higher mortality rate than partici-

pants; Table 1), The median change of deterioration for an outcome measure was added to the individual baseline value, and imputed, substituting missing data at follow-up. The same imputation method has been used for other analyses of *Elderly Persons in the Risk Zone*,^{12,13} and was used for all follow-ups. For those with missing values for more than one follow-up, the imputation was done step-wise, from baseline to 3 months, from 3 months to next follow-up and so forth. The reason for this step-wise imputation for those values missing from more than one follow-up was the expected deterioration over time. To impute the same value for all missing follow-ups would be imputation by the last value carried forward from the first imputed value. Last value carried forward assumes no change over time, and is thus not applicable for this study.^{28,29} Worst-case change could have been an option, but we considered step-wise median change of deterioration to be more conservative.

The proportion of participants being satisfied was compared for the three groups at baseline, 3 months, one year and two years, analyzed using Chi-two and odds ratio (OR) to compare outcomes between groups. A two-sided p-value of 0.05 or less and a 95% confidence interval (CI) were considered significant. Statistical analyses were performed using Statistical Package for Social Science version 19 (Chicago: SPSS Inc.).

Results

The flow of participants through the study is shown in the CONSORT diagram, Figure 1.

There were no statistically significant differences between the control group and the intervention groups in baseline characteristics in terms of demographic background variables, frailty and self-perceived health (Table 2) or for life satisfaction at baseline (Table 3).

The drop-outs at 3 months were 9% (n=42) with drop-outs in all groups but there was a significant larger proportion in the control group, 17%, compared to preventive home visits, 7%, and senior meetings, 6% (P=0.006). The significant difference in drop-out rates remained at all follow-ups. At one year the drop-out from baseline was 15% (n=67) with 23% in the control group, 10% in preventive home visits and 14% in senior meetings (P=0.009). At two years the corresponding rates were 34%, 20% and 22% (P=0.036), with a total drop-out rate of 24% (n=112) from baseline to the two year follow-up. The reasons for drop-outs in the three groups are shown in Figure 1. The most common reason were not interested (n=41), deceased (n=28) and too ill (n=21).

No significant differences were found

between participants and drop-outs at three months, one year and two years concerning gender, marital status, academic education and living conditions at baseline, see Table 1. There were no significant differences in age between drop-outs and participants at the 3 month and one year follow-ups, but at the two year follow-up the participants were significantly younger than those not participating. At the three months and one year follow-ups, the drop-outs had statistically significant lower self-rated health at baseline compared to the participants. The drop-outs had a higher proportion of municipal home help service at the one year follow-up. In addition, at the two year follow-up 28 persons of the drop-outs had deceased (25%).

Life satisfaction decreased over time in all groups (Table 3). The decrease was more pronounced in the control group than in the intervention groups. The odds of still being satisfied at the one and two year follow-up doubled for many of the life satisfaction variables for the intervention groups compared to the control group. The satisfied proportion was significantly higher in senior meetings compared to the control group for all variables except financial situation, contacts with friends and activities of daily living at one year and for all life satisfaction variables at the two year follow-up. For preventive home visits, there was

Table 1. Comparisons between participants and drop-outs concerning baseline characteristics, self-rated health, proportion receiving municipal home help and deceased.

Characteristics	3 months			12 months			24 months		
	Participants n=417 (%)	Dropouts n=42 (%)	P	Participants n=392 (%)	Dropouts n=67 (%)	P	Participants n=347 (%)	Dropouts n=112 (%)	P
Female	65.0	52.4	0.10	65.1	56.7	0.19	65.1	59.8	0.31
Married/cohabitant	45.2	44.6	0.94	45.2	41.8	0.60	45.0	43.8	0.82
Academic education	18.5	19.0	0.93	21.9	19.4	0.84	23.1	16.1	0.30
Below age 85 at baseline	56.8	57.1	0.97	58.2	49.2	0.17	61.5	42.8	0.001
Good self-rated health, at baseline*	82.0	69.0	0.04	82.4	71.6	0.04	80.9	80.3	0.88
Good self-rated health, at 12 months*							72.9	50.9	0.00
Municipal home help				13.8	31.3	0.00			
Deceased	0	11.9		0	16.4		0	25.0	

*Excellent, very good or good.

Table 2. Baseline characteristics of study participants.

Characteristics	Control n=114 (%)	Preventive home visit n=174 (%)	Senior meetings n=171 (%)	P
Median age (range)	86 (80-97)	86 (80-94)	85 (80-94)	0.24
Median sum of frailty indicators (range)*	1 (0-5)	1 (0-5)	1 (0-5)	0.89
Female	61	64	66	0.63
Living alone	48	57	60	0.10
Academic education	22	23	19	0.69
Self-rated health (excellent/very good/good)	79	80	83	0.63

*The sum of six core frailty indicators: weakness, fatigue, weight loss, low physical activity, poor balance, and gait speed.

a significant difference compared to the control group at the one year follow-up for life as a whole, leisure time and psychological health, and at the two year follow-up for all variables except vocational situation. At the three month follow-up, the trend was the same for many of the variables, with higher satisfaction in the intervention groups compared to the control group, though not statistically significant. There were no statistically significant differences between the two intervention groups in life satisfaction at the follow-ups, as shown by the overlapping confidence intervals in Table 3. Examples of the development over time (for satisfaction with activities of daily living and physical health) are shown graphically in Figure 2.

Discussion

This study shows that it is possible to delay the decrease in life satisfaction among older adults by health-promoting interventions such as preventive home visits and senior meetings.

All three groups declined in all aspects of life satisfaction, which is in accordance with what has been shown earlier,¹⁷ but both intervention groups declined significantly less than the control group. Earlier reports from the intervention study Elderly Persons in the Risk Zone found that both interventions postponed deterioration in self-rated health as well as dependence in activities of daily living, with more pronounced effects in the senior meetings.^{12,13} Thus, the

interventions have been successful in improving aspects of older adult's health and well-being, and have the potential to help frail older adults to postpone the decline in life satisfaction.

Higher self-rated health and better function in daily activities ought to have impact on life satisfaction, since both health status and function are known to have an impact on life satisfaction.^{17,19} Our results are in accordance with the findings of Enkvist *et al.*, who found that life satisfaction remained on a high level for those whose functional capacity remained independent during a 3-year follow up.³⁰

Both interventions were designed for promoting health and coping with effects of the aging process,¹¹ especially the intervention with senior meetings aimed at giving tools and

Table 3. Proportion and odds ratios for being satisfied at baseline and follow-ups, (95% confidence interval, CI). The control group is the reference group. P-value for differences in proportions between the three groups, chi-2.

Satisfaction with	Control		Preventive home visit		Senior meeting		P (chi-2)
	%	OR	%	OR (95% CI)	%	OR (95% CI)	
Life as a whole							
Baseline	97.4	1	100.0	*	97.1	0.90 (0.21-3.83)	0.08
3 months	93.0	1	94.8	1.38 (0.52-3.70)	98.2	4.23 (1.10-16.29)	0.08
1 year	80.7	1	91.4	2.53 (1.25-5.13)	91.2	2.49 (1.23-5.03)	0.008
2 years	71.0	1	87.4	2.81 (1.54-5.14)	81.9	1.84 (1.05-3.23)	0.002
Vocational situation							
Baseline	97.4	1	93.7	0.40 (0.11-1.47)	94.2	0.44 (0.12-1.62)	0.35
3 months	90.4	1	94.3	1.75 (0.72-4.27)	95.3	2.18 (0.85-5.59)	0.22
1 year	78.1	1	87.4	1.94 (1.03-3.64)	89.5	2.39 (1.23-4.62)	0.02
2 years	71.0	1	78.7	1.51 (0.88-2.60)	81.9	1.84 (1.05-3.23)	0.09
Financial situation							
Baseline	99.1	1	96.0	0.21 (0.03-1.74)	97.7	0.37 (0.04-3.35)	0.25
3 months	98.2	1	92.5	0.22 (0.05-1.00)	95.3	0.36 (0.08-1.75)	0.09
1 year	85.1	1	91.4	1.86 (0.89-3.89)	90.0	1.59 (0.77-3.26)	0.22
2 years	74.6	1	87.9	2.49 (1.34-4.63)	86.6	2.20 (1.19-4.04)	0.005
Leisure time							
Baseline	94.7	1	93.7	0.82 (0.30-2.29)	97.1	1.84 (0.55-6.19)	0.32
3 months	90.3	1	93.1	1.44 (0.61-3.39)	95.9	2.50 (0.94-6.66)	0.17
1 year	76.3	1	88.5	2.39 (1.27-4.51)	86.6	2.00 (1.08-3.70)	0.01
2 years	64.9	1	79.9	2.15 (1.26-3.66)	77.2	1.83 (1.08-3.09)	0.01
Contacts with friends							
Baseline	97.4	1	94.2	0.44 (0.12-1.65)	93.6	0.39 (0.11-1.44)	0.34
3 months	91.2	1	90.3	0.89 (0.39-2.02)	91.8	1.08 (0.46-2.52)	0.87
1 year	84.2	1	85.6	1.12 (0.58-2.16)	84.8	1.05 (0.54-2.01)	0.94
2 years	67.5	1	78.7	1.78 (1.04-3.04)	82.5	2.26 (1.30-3.94)	0.01
Activities of daily living							
Baseline	99.1	1	98.3	0.50 (0.05-4.91)	100	*	0.23
3 months	96.5	1	98.8	3.13 (0.56-17.36)	97.1	1.21 (0.32-4.60)	0.38
1 year	86.8	1	92.0	1.73 (0.80-3.74)	93.0	2.01 (0.90-4.47)	0.18
2 years	71.9	1	86.2	2.44 (1.35-4.42)	87.1	2.64 (1.44-4.85)	0.001
Physical health							
Baseline	93.9	1	91.4	0.69 (0.27-1.76)	95.3	1.33 (0.47-3.78)	0.33
3 months	92.1	1	94.8	1.57 (0.60-4.09)	94.2	1.38 (0.54-3.51)	0.63
1 year	75.4	1	83.9	1.70 (0.94-3.06)	90.1	2.95 (1.53-5.69)	0.004
2 years	67.5	1	78.7	1.78 (1.04-3.04)	79.0	1.80 (1.05-3.08)	0.05
Psychological health							
Baseline	100	1	98.3	*	96.5	*	0.11
3 months	93.0	1	97.1	2.55 (0.81-8.00)	98.2	4.23 (1.10-16.29)	0.05
1 year	80.7	1	90.0	2.07 (1.06-4.07)	90.1	2.17 (1.09-4.29)	0.04
2 years	71.0	1	87.9	2.97 (1.61-5.46)	83.6	2.08 (1.17-3.69)	0.001

*Too low expected values in some cells to calculate OR.

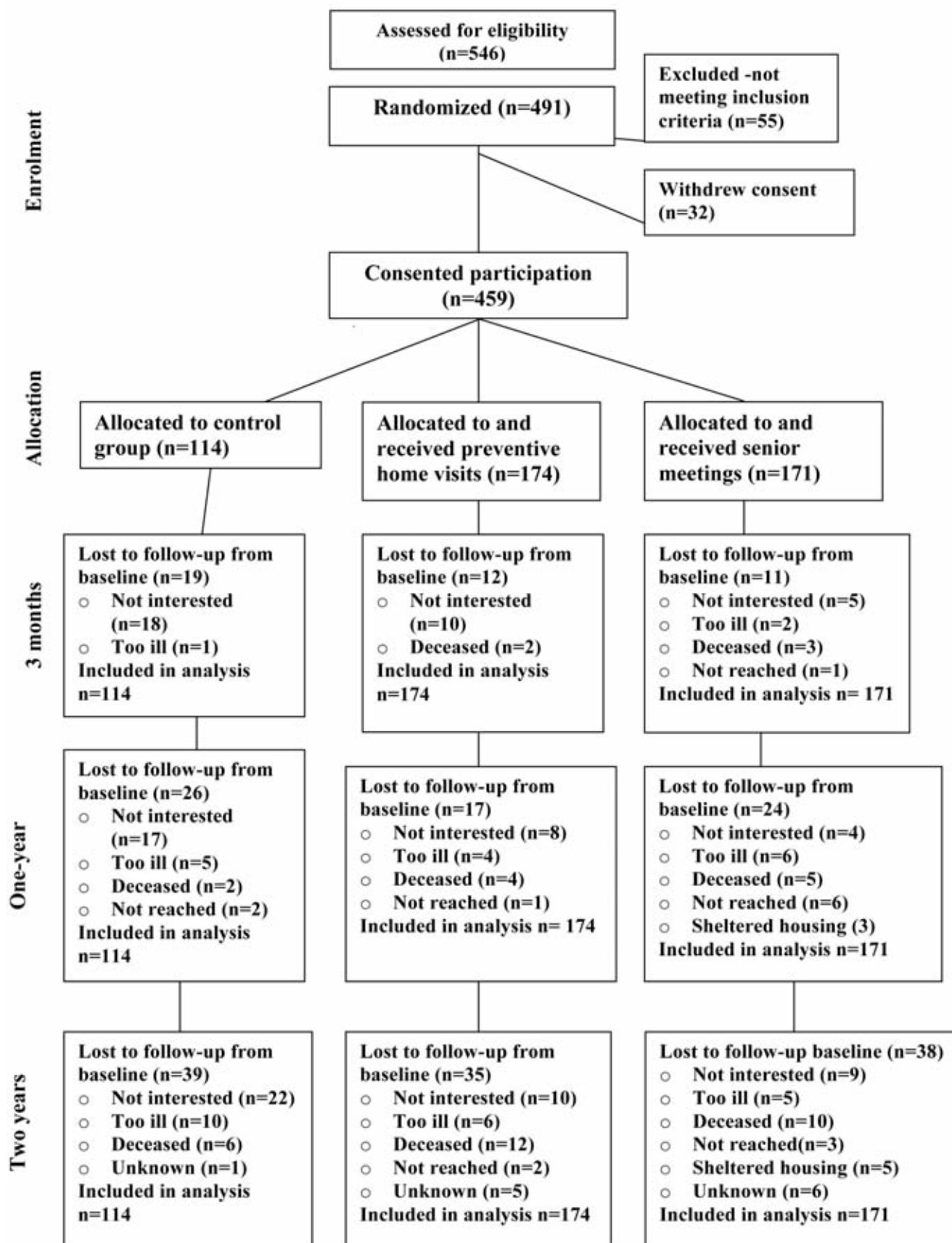


Figure 1. The flow of participants through the study *Elderly persons in the risk zone*.

strategies for solving various problems associated with aging. In addition, there was a social component of the senior meetings. At the preventive home visits the participants were informed about, among other things, local meeting places and local associations. All these aspects might have the potential to increase life satisfaction. For example, it has been shown that being satisfied with social contacts may buffer the dissatisfaction due to reduced functional ability,¹⁷ and that there is a positive association between social activities, leisure activities and life satisfaction.³¹ The effects on participants in the senior meetings was not more pronounced than for the preventive home visit group, though statistically significant for somewhat more domains of life satisfaction in the senior meeting group. In addition, there were no statistically significant differences in life satisfaction at the follow-ups between the two intervention groups. Thus, both interventions were effective according to our results. Both interventions have the potential to increase the older adult's potential to be kept occupied as usual, have friends and to feel able to manage their lives. All aspects that have been shown to be associated with higher satisfaction with daily life for frail older adults.²¹

The randomized controlled design is a major strength of the study, and the fact that we managed to enrol and retain very old persons in the intervention and the follow-ups. On the other hand, the high age of the participants leads inevitably to high drop-out rates. The drop-out rates were higher in the control group at all fol-

low-ups. Since there were indications of the drop-outs to be worse off than the participants, it might be interpreted as the control group having a poorer outcome than the intervention groups. There were many indications of the drop-outs being worse, with a substantial number having deceased. That drop-outs in intervention studies targeting older persons are more likely to have worse outcomes has also been confirmed earlier.³² The imputation was done in the same way for all drop-outs, also for the deceased. An alternative could have been to do imputation with worst-case scenario for the deceased, which ought to have made the drop-out even worse than with the median change. Since the drop-out rates were highest in the control group, imputation with worst-case scenario would have made the differences between interventions and control group even greater. So we find the median change to be more conservative, and with lower risk of overestimating the effects of the intervention. Other limitations are the many items leading to a risk for significant results by mere chance, and the fact that we did not do any adjustment for multiple comparisons. But since all results point in the same direction, and we draw no conclusion from a single item, we argue for that our interpretation of the results is valid.

We aimed at a sample of older adults not yet being so frail. Thus, we did not include those being dependent or having cognitive impairments. This is important to remember, since this gives us a more homogenous sample and it can not be seen as representative of all older adults, only for pre-frail older adults living

independently in the community. The proportion of the different frailty indicators shows that the participants experiences different degrees for frailty, with approximately 40% reporting fatigue, 60% visual impairment and about 30% low level of physical activity, giving a sample that can be seen as representative of a pre-frail population of older adults.¹¹

So far the differences between the two interventions – preventive home visit and senior meetings – have been small and insignificant. Thus, it is not yet possible to determine if one intervention is superior to the other, or if individual characteristics of the older adults influence the outcome. For this, it needs further analysis. A qualitative study by Behm *et al.* showed that the older adults experienced the senior meetings as a key to action. They concluded that group education with a multi-professional approach may be a successful model for achieving an exchange of knowledge, which may possibly empower the participants, give them role models, the opportunity to learn from each other and a sense of sharing problems with people in similar circumstances.³³

The interventions could be applied in other contexts and settings; however, it has to be designed to suit the actual target group. The results from *Risk zone* can be used as a knowledge base for planning interventions for other groups, in other countries and in other care settings. When doing so, it is vital to conform and adapt the intervention to the actual target group. Our research group are now adapting the interventions to target older immigrants in Sweden, and testing the interventions for these groups.

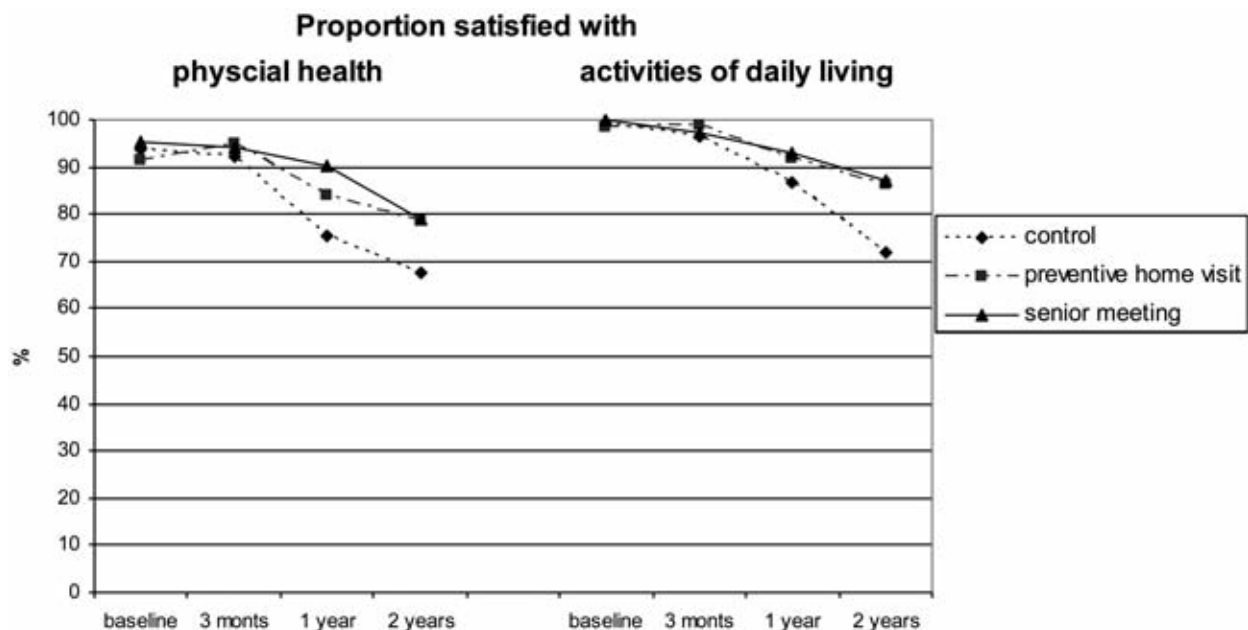


Figure 2. Proportion satisfied with physical health and activities of daily living.

Conclusions

This study has shown that both preventive home visits and senior meetings increased the odds of maintaining life satisfaction by up to two years. Thus, a health promoting intervention can delay the decline in life satisfaction among older adults who are at risk of becoming frail, and to help frail older adults to sustain a higher quality of life.

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