Predictors of Dropout in Exercise Trials in Older Adults: The Generation 100 Study

Hallgeir Viken[1], Line Skarsem Reitlo[1,2], Nina Zisko[1], Javaid Nauman[1,3], Nils Petter Aspvik[4], Jan Erik Ingebrigtsen[4], Ulrik Wisløff[1,5] , and Dorthe Stensvold[1]

[1]K.G. Jebsen Center of Exercise in Medicine at Department of Circulation and Medical Imaging, Faculty of Medicine and Health Sciences, Norwegian University of Science and Technology (NTNU), Trondheim, Norway; [2]Department of Cardiology, St Olavs Hospital, Trondheim University Hospital, Trondheim, Norway; [3]Institute of Public Health, College of Medicine and Health Sciences, United Arab Emirates University, Al-Ain, United Arab Emirates; [4]Department of Sociology and Political Science, Faculty of Social and Educational Sciences, NTNU; [5]School of Human Movement & Nutrition Sciences, University of Queensland, Australia

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Corresponding author:
Hallgeir Viken, Ph.D., Norwegian University of Science and Technology, Department of Circulation and Medical Imaging, PO Box 8905, 7491 Trondheim, Norway. Telephone: 0047 72574393. Fax: 0047 72828372. E-mail: hallgeir.viken@ntnu.no

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Abstract

Purpose: Dropout from exercise programs, both in the real world and in research, is a challenge, and more information on dropout-predictors is needed for establishing strategies to increase the likelihood of maintaining participants in a prescribed exercise program. The aim of the present study was to determine the dropout rate and its predictors during a 3-year exercise program in older adults.

Methods: In total, 1514 men and women (age 72.4±1.9 years) were included in the present study. Participants were randomized to either a supervised exercise intervention or to follow national guidelines for physical activity (PA). Self-reported demographics (e.g. education), general health, morbidity (e.g. heart disease, memory loss, psychological distress), smoking and PA were examined at baseline. Cardiorespiratory fitness (CRF) and grip strength were directly measured at baseline. Dropout rate was evaluated after 1- and 3-years. Multivariate logistic regression analysis was used to identify dropout-predictors.

Results: The total dropout rate was 11.0% (n=166) after 1-year and 14.9% (n=225) after 3-years. Significant predictors of dropout after 1-year were low education, low grip strength, lower CRF, low PA level and randomization to supervised exercise. The same predictors of dropout were significant after 3-years, with reduced memory status as an additional predictor.

Conclusion: This is the largest study to identify dropout-predictors in a long-term exercise program in older adults. Our findings provide new and important knowledge about potential risk factors of dropout in long-term exercise programs in older adults.

Key words: Elderly, physical activity, randomized controlled trial, attrition

Introduction

Due to the rapid ageing of populations worldwide, a rise in the prevalence of chronic diseases is expected (1). This, in turn, could lead to high disability rates and an increasing demand for long-term care (2).

Epidemiological evidence suggests that physical activity (PA) is one of the most important factors when it comes to preservation of good health at older ages (3). Physically active individuals are more likely to age successfully (3), reach a disability threshold later compared to their inactive counterparts (4), and have lower risk of premature death compared to individuals not regularly engaging in physical activity (5). However, making people exercise and keeping them in exercise programs is a major challenge (6), resulting in high rates of dropout. Understanding major reasons for dropping out from a prescribed exercise program may help tackle barriers to partaking in PA and exercise programs in ageing populations.

Knowledge about dropout rates from PA and exercise programs in older adults is scarce, and is commonly based on small samples and programs with short durations (7). Studies of PA- and exercise programs report dropout rates of 20-50 % within the first 3-6 months (7-9). Even fewer studies have provided *predictors* of dropouts (9-12). Identifying characteristics associated with risk of dropout from exercise programs could have both practical and clinical significance, as one might come closer to developing a “screening instrument” to discover participants at risk of dropping out (9, 12).

Thus, dropout rates and dropout predictors among older adults involved in exercise programs need to be further examined, especially with a long-term follow-up. To fill the gap in the scientific knowledge, we aimed to examine total dropout rates and identify reasons for dropouts, after one- and three years of an exercise intervention program in a large sample of older Norwegian adults.

Methods

Participants

All men and women born between January 1, 1936 and December 31, 1942, with a permanent address in the municipality of Trondheim, Norway (n=6966), were invited to participate in a randomized controlled exercise trial, Generation 100 (ntnu.edu/cerg/generation100). A detailed description of Generation 100 has previously been published (13). The exclusion criteria were related to disease and medical conditions that could either preclude exercise participation, or compromise with the participants' safety during exercise sessions (13). The present study used baseline data from Generation 100 as a basis (collected between August 2012 and June 2013), and dropout rates were examined after 1- (2013-2014) and 3-years (2015-2016) of intervention.

Participants excluded for health conditions and participants who died during the follow-up period (n=53), were not included in the present study. In total, 1514 participants (50.7% women), with an age range of 70-77 years at baseline, were included in the analyses. The study was approved by the Regional Committee for Medical Research Ethics (REK 2017/168B) and all participants gave their written informed consent before participation.

Measurements

Registry data

Data regarding age and sex were obtained from the National Population Registry. Age was calculated from month/year of birth and month/year of inclusion at baseline, and dichotomized into the two most similar sized age groups, 70-72 years (56.8%) and 73-76 years (43.2%).

Questionnaire data

Previously described questionnaires (13) provided information about education, living situation, social support, smoking status, medication use, PA level, health status, heart disease, psychological distress and memory status. The questionnaires were mainly based on questionnaires from the third wave of The Nord-Trøndelag Health Study (HUNT3) (14).

Education was dichotomized into low education (not attended college or university) vs. high education (attended college or university). Living alone, smoking, self-report of good health and self-report of 30-min PA per day were dichotomized (no vs. yes). Heart disease was dichotomized (no vs. yes), where presence of heart disease means that the participants have reported at least one heart disease (myocardial infarction, angina pectoris, heart failure, atrial fibrillation, or other heart disease). Prescription medications was dichotomized (0 vs. 1 or more), based on the question "How many prescription medications do you use in total?". The same procedure was used in a previous study with reference data for cardiorespiratory function in Generation 100 as a means to distinguish between healthy and unhealthy participants (15). Social support was based on the question "Do you have friends that can help you when you need them? (no vs. yes)". Psychological distress was based on the question "Have you had, or do you have, mental health problems you sought help for? (no vs. yes)". Memory status was based on the question "My memory is good (no vs. yes)".

Cardiorespiratory fitness

The testing of cardiorespiratory fitness (CRF), measured as peak oxygen uptake (VO_{2peak}), was performed at the NeXt Move core facility, Norwegian University of Science and Technology, St Olavs University Hospital (ntnu.edu/dmf/nextmove). The VO_{2peak} assessments ($mL \cdot kg^{-1} \cdot min^{-1}$) were made during walking or running on a treadmill, or during cycling on a stationary bike. The participants (3%) who were not able to walk on a treadmill due to reduced functionality or leg pain used cycling. The test started with 10 minutes at a chosen warm-up speed. Approximately every two minutes, either the incline of the treadmill was increased by 2%, or the speed was increased by 1 km/h. The test protocol ended when participants were no longer able to carry a workload due to exhaustion or until all the criteria for a maximal oxygen uptake were reached (13). The CRF variable was used as a continuous variable.

Body mass index

Body mass index (BMI) was calculated as body weight (kg) divided by the squared value of height in meter (kg/m^2). Height was measured with a mechanical telescopic measuring stadiometer (Seca 222, Hamburg, Germany). Weight was measured using bioelectrical impedance (Inbody 720, BIOSPACE, Seoul, Korea). A BMI value < 25.0 kg/m^2 was categorised as normal weight, while a BMI exceeding ≥ 25.0 kg/m^2 was classified as overweight.

Grip strength

Grip strength of the hand was measured with the JAMAR Hydraulic Hand Dynamometer (Lafayette Instrument Company, Lafayette, IN, USA), and categorized as low (below mean

<43.8 kg for men and <26.1 kg for women) and high (≥43.8 kg for men and ≥26.1 kg for women).

Dropouts

Participants who completed the study program were classified as “contenders”. Those who actively withdrew from participation in the study were considered “dropouts”. Participants in the Generation 100 study were free to withdraw from study participation without stating specific reasons for their withdrawal. Therefore, dropout was registered independently of whether reasons for withdrawal were reported to the study center or not. In addition to the statistical analyses of baseline predictors of dropouts, we also present the different reasons for withdrawal from dropouts who provided that information. The different reasons reported were categorized into health related problems, lack of time, loss of interest in the project and family situation (e.g. taking care of partner). Of the 225 dropouts, 102 did not specify dropout-reasons.

Exercise intervention

The participants were stratified by sex and marital status and randomized in a 1:1 fashion to either a supervised exercise intervention or to receive recommendations for PA. Participants in the supervised exercise group were asked to exercise twice per week. They were offered two organized exercise sessions per week, in addition to one exercise session every sixth week with mandatory attendance. They were also asked to fill out training diaries (web or paper based) after each exercise session. The unsupervised exercise group was asked to follow the current (per year 2012) national PA recommendations in Norway, meaning 30 minutes of moderate intensity PA (12-13 on the Borg 6-20 rating of perceived exertion [RPE] scale) per day. No further supervision was given. Both the supervised- and unsupervised exercise groups underwent health examinations at baseline, and after 1- and 3-years.

The supervised exercise group was further randomized in a 1:1 fashion to either continuous moderate intensity training (MCT) or high-intensity interval training (HIIT). The MCT group was prescribed two weekly exercise sessions of 50-min continuous activity at 70% of peak heart rate (HR_{peak}), or approximately 13 on the Borg 6-20 RPE scale. The HIIT group was prescribed two exercise sessions a week with 10-min warm-up followed by 4x4 min intervals at 85-95% of HR_{peak}, or minimum 16 on the Borg 6-20 RPE scale.

Statistical analysis

Baseline characteristics are presented as means and standard deviations, or percentages (Table 1). Statistical analyses of predictors of dropouts were performed with logistic regression. Logistic regression provided opportunities to present odds ratios for dropouts versus contenders for each predictor variable. Initially, all potential predictor variables were included in separate bivariate analyses with dropout as the dependent variable and the potential predictors after 1- and 3-years, respectively, as independent variables [see Table, Supplemental Digital Content 1, Factors independently associated with dropout after 1- and 3-years (bivariate logistic regression)]. All significant ($p < 0.05$) predictor variables from the bivariate logistic regression analyses were retained in the final multivariate logistic regression models of dropouts after 1-year and 3-years (Tables 2-3). A p-value < 0.05 was required to declare statistical significance and odds ratios (OR) were presented with 95% confidence intervals (CI). Participants with missing data for any predictor variables were excluded from the final multivariate model. The sample size was therefore reduced from the initial 1514 participants to 1110 participants in the final multivariate logistic analysis of dropout after 3-years. All statistical analyses were performed using PASW Statistics 23 for Windows (IBM Corporation, Somers, NY, USA).

Results

Participant characteristics and dropout rates

Figure 1 presents flow of dropout for both men and women. Table 1 shows the baseline characteristics for all participants, and for dropouts from supervised- and unsupervised exercise groups, separately. Total dropout rate after 1-year was 11.0% (103 women). The dropout rates across randomization were; unsupervised exercise 6.8% (n = 51) and supervised exercise 15.2% (MCT 12.4% (n = 46) and HIIT 17.7% (n = 69)). Total dropout rate after 3-years was 14.9% (135 women). The dropout rates across randomization were; unsupervised exercise 9.4% (n = 71) and supervised exercise 20.3% (MCT 16.8% (n = 62) and HIIT 23.7% (n = 92)). Participants with missing predictor variables excluded from the final multivariate logistic regression models were not any different in terms of dropout to those with complete data (17.8% vs. 13.8% dropout rate, $p > 0.05$).

Predictors of dropouts

Bivariate logistic regression analyses showed that age, living situation, social support, prescription medication and heart disease were not significantly associated with dropout after 1-year [see Table, Supplemental Digital Content 1, Factors independently associated with dropout after 1- and 3-years (bivariate logistic regression)]. Significant differences between contenders and dropouts were found with respect to sex, education level, BMI, self-reported health, psychological distress, memory status, smoking, CRF, grip strength, self-reported 30 min of PA per day, and type of intervention. After 3-years, there were additional differences between contenders and dropouts in age, living situation and number of prescription medications.

All significant predictors from the bivariate analyses were included in the final multivariate analyses of dropouts after 1- (Table 2) and 3-years (Table 3). Significant predictors of dropouts after 1-year were low level of education, lower CRF, low grip strength, performing less than 30-min of PA per day, and randomized to supervised exercise (Table 2). The same predictors of dropouts were significant after 3-years, with reduced memory status as an additional predictor (Table 3).

We also analyzed predictors of dropouts after 3-years in the unsupervised- and supervised exercise group separately. In both groups, low level of education, lower CRF and reduced memory status were significant predictors after 3-years (see Table, Supplemental Digital Content 2, Multivariate logistic regression model of factors associated with dropout in the unsupervised exercise group – after 3-years). In the supervised exercise group, performing less than 30-min of PA per day was an additional predictor (see Table, Supplemental Digital Content 3, Multivariate logistic regression model of factors associated with dropout in the supervised exercise group – after 3-years).

Self-reported reasons for dropout

Self-reported information from the dropouts provided further valuable insight. The most frequently reported reason for dropping out after both 1- and 3-years was health related problems (1-year: 54.4%, 3-years: 57.7%), followed by loss of interest in the project (1-year: 26.6%, 3-years: 20.3%), lack of time (1-year: 15.2%, 3-years: 17.1%) and family reasons (1-year: 3.8%, 3-years: 4.9%) (Table 4).

Discussion

The main finding of the current study was that randomization to supervised exercise, low education level, PA of less than 30-min per day, low grip strength and lower CRF were predictors of dropouts after 1- and 3-years of an exercise intervention in older adults. While reduced memory status was not significant after 1-year, it was a predictor of dropout after 3-years. The total dropout rates were 11.0% after 1-year, and 14.9% after 3-years.

To our knowledge, this is the first analysis of dropout from a long-term exercise program in a large group of older adults. Most studies of dropout related to exercise have been exploratory (16) and existing literature on dropout does not allow for a quantitative meta-analysis, as studies are overwhelmingly heterogeneous in terms of design and methodology (17).

Our study demonstrated that being randomized to a long-term supervised exercise program predicted a higher odds ratio of dropping out compared to being randomized to a long-term unsupervised exercise program, both after 1- and 3-years. This has also been shown in a shorter intervention (10). This finding might be due to the fact that the participant burden in the present study is unequally distributed between the supervised- and unsupervised exercise groups. The participants in the unsupervised exercise group could continue their lives almost uninterrupted compared to the supervised exercise group – but still receive regular and thorough health examinations with no economic costs. The supervised exercise group, on the other hand, experience a much higher burden and degree of obligation related to their study participation. Their burden is more demanding since they are obliged to do at least two exercise sessions per week, including one mandatory attendance every six weeks, for five years. In addition, in our study, the supervised exercise group was asked to fill out training diaries after every exercise session.

Our results showed that low education level increased the odds ratio for dropping out of an exercise program, a finding consistent with Schmidt et al. (12). Low education level is associated with shorter longevity and a higher risk of cardiovascular disease (18, 19). One might therefore speculate that older adults with a high education level are more likely to act according to health messages, e.g. to follow a long-term exercise program.

We also found that performing less than 30 minutes of PA per day at baseline increased the odds ratio of dropping out. These results are in line with Jancey et al. who found that older adults not meeting PA recommendations at baseline had a higher likelihood of dropping out of an exercise program (10). Interestingly, we found hand grip strength at baseline to be a significant predictor of dropout. Grip strength is formerly found to be a predictor of future disability, morbidity, and mortality (20-22). Loss of grip strength might be a good marker of underlying ageing processes (22), and our data may indicate that assessment of grip strength should be used more actively as a tool to identify older adults at risk of dropout from exercise.

While self-reported memory status did not influence dropout after 1-year, our results showed that it was a significant predictor of dropout after 3-years. Interestingly, the reduced memory status was a significant predictor of dropout in both the supervised- and unsupervised exercise groups at 3-years. Our results are in line with Mullen et al. (9) who found that study dropouts exhibited a higher frequency of forgetfulness compared to non-dropouts after a 12 month exercise program in older adults. It is reasonable to assume that reduced memory can influence the ability to perform daily activities. Former studies have shown an association between the ability to perform daily activities and exercise behavior (9, 23), which might explain why older adults with a reduced memory are more likely to drop out of an exercise intervention.

In line with a previous finding on younger adults with type 2 diabetes, our data showed that lower CRF was a significant predictor of dropout (24). Initial CRF might influence both willingness and ability to adapt to an assigned exercise program. Although our study was not designed to examine the physiology, one might speculate that less fit individuals are also less physiologically equipped to adapt to exercise stress, which can make it harder to sustain within the assigned exercise program.

Critics (25, 26) have raised questions about the feasibility of high-intensity interval training as a public health initiative. It has also been argued that high-intensity interval training has high efficacy but low effectiveness, and larger and longer studies under free-living conditions have been called for to examine high-intensity interval training feasibility among older adults (26, 27). Since the Generation 100 is still ongoing we cannot yet conclude, but we could argue that the small dropout rate difference between the MCT (16.8%) and HIIT (23.7%) after 3-years is very promising considering the large study sample size.

The statistical model explained 13.5% of the variance in dropouts. The explained variance might be considered small to medium, and this implies that additional factors can influence dropout. However, we also know that it is difficult to compare the explained variance values across studies, due to differences in both study samples and analyzed variables. In addition to the (baseline) predictors included in our statistical analyses, one should be aware of other potential factors, e.g. sudden changes in health status or daily life situation, during the intervention period. These factors are probably a lot more relevant for this age group than among younger adults. Self-reported information from the dropouts revealed that the main reason for dropping out was due to problems related to health. Interestingly, we did not find self-reported health at baseline to be a predictor of dropouts. However, in the oldest age group, major changes in health status can occur fast which can make participation in a long-term exercise program challenging. Our findings illustrate that even though identifying potential predictors of dropout can help classifying individuals at risk of leaving an exercise program, one cannot prevent dropout from all causes. Interestingly, all self-reported reasons for dropping out increased in relative strength from 1- to 3-years, except for lack of interest, which decreased in strength. This, combined with the fact that total dropout rates increased the most during the first year, indicates that it might be especially important to follow-up participants closely the first year of an exercise program. A qualitative study interviewing exercise class instructors supported this when concluding that “once older adults became established in the class they often did not drop out unless for a valid reason” (28).

Despite the abovementioned predictors of dropout we would argue, in line with Rejeski et al. (29), that the exercise intervention appears to be well tolerated by older adults. We found that neither age, sex, living situation, total number of prescription medications, self-reported general health, BMI nor smoking status influenced the odds ratio for dropout in the supervised exercise group. Furthermore, the total dropout rates of 11.0% (1-year) and 14.9% (3-years) must be considered very low compared to former studies with shorter duration (7-9). We think it is hard to say how this lower total dropout rate might influence the generalizability of our findings. However, we think it is important to focus on the predictors that we found. Only small adjustments to individual follow-up could probably reduce some of the dropout even further. In addition to the free and thorough health examinations, reasons for the low dropout might be that Generation 100 has close and frequent contact with the participants through information meetings, monthly newsletters and telephone calls. The project also has its own Internet site with information, and email address and telephone numbers where participants can contact the research staff for questions and feedback. Thus, as former studies have indicated (30, 31), close follow-up of the participants might be crucial when aiming to sustain a physically active lifestyle and avoiding dropout in older adults.

Considering the future ageing populations worldwide, responsibility for personal health becomes even more important. There is an infinite amount of data on the health effects of exercise and PA. Therefore, an important focus now is how to get older adults to exercise and maintain their exercise behavior. The present study has provided knowledge on how to reduce dropout from exercise participation in older populations. To improve long-term participation in exercise programs or physical activity interventions, participants could be categorized according to predictors outlined in this manuscript. Categorizing participants based on predictors would allow researchers/instructors to identify individuals at risk of dropout early on and provide them with additional follow-up or support to secure success. E.g. identify potential barriers to exercise participation and provide individualized exercise programs.

Strengths and limitations

The current study had several methodological and conceptual strengths that represent improvements over previous research in this field. We used data from a randomized controlled exercise trial, the intervention had an extended duration of 3-years and the study population sample consisted of a large number of older adults recruited from the general population.

One could question whether the intervention and trial situation tell us about long-term follow-up to real groups. The exercise part should be very feasible on a larger scale, since it could be performed anywhere, at a low cost and with few individual adjustments. The regular health examinations are expensive. However, if examinations can help explain the low dropout, simplified versions can be performed at a lower cost to increase feasibility on a larger scale.

Future studies of dropout would benefit from also including qualitative data. For example, interviews examining perceptions of dropout from participants who have dropped out could have contributed to a better understanding of this topic. However, due to strict legislation related to medical- and health research in Norway, the regional ethical committee did not allow us to collect qualitative data on participants who withdrew from the study.

The analyses in the present study could be considered as an intention-to-treat analysis of participation, since we have not considered the degree to which non-dropouts followed the ascribed intervention protocol.

The Generation 100 sample was relatively healthy and more educated compared to the invited, but not participating, subjects (13). Any generalization regarding our findings on other populations are therefore uncertain. Yet, our sample consisted of participants with a wide range of PA levels, CRF values and disease status. We, therefore, consider our population a good representation of the general older Norwegian population.

Conclusion

Our data shows that type of intervention, low education level, low PA levels, low grip strength, reduced memory status and lower CRF were all predictors of dropouts in this 3-year follow-up study. This was the first study on dropout in a long-term exercise program with a large number of free-living older adults. Our findings provide important information for clinicians, healthcare professionals, researchers and politicians, for planning long-term initiatives to increase physical activity or exercise among older adults.

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Conflict of Interest

There are no conflicts of interest to disclose. The results of the present study do not constitute endorsement by ACSM. The authors declare that the results of the study are presented clearly, honestly, and without fabrication, falsification, or inappropriate data manipulation.

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Figure captions

Figure 1. Flow of dropout after 1- and 3-years, for men and women

Supplemental Digital Content

Supplementary Table 1.docx— Factors independently associated with dropout after 1- and 3-years (bivariate logistic regression)

Supplementary Table 2.docx— Multivariate logistic regression model of factors associated with dropout in the unsupervised exercise group – after 3-years

Supplementary Table 3.docx— Multivariate logistic regression model of factors associated with dropout in the supervised exercise group – after 3-years**Table 1.** Participant characteristics at baseline

Variables	All	Dropout 1-year		Dropout 3-years	
		Supervised exercise	Unsupervised exercise	Supervised exercise	Unsupervised exercise
Number of participants (%)	1514	115 (15.2)	51 (6.8)	154 (20.3)	71 (9.4)
Age, yr	72.4±1.9	72.6±1.8	72.6±2.0	72.6±1.8	72.9±2.1
Sex (women %)	50.7	66.1	52.9	64.3	50.7
Living alone (%)	25.5	33.0	20.4	33.8	25
Education (high %)	50.4	31.0	34.7	35.5	35.8
Social support (yes %)	92.9	92.2	91.8	91.5	94.0
Body mass index (kg/m_2)	26.0±3.6	27.0	26.7±3.5	26.8±4.2	27.2±3.6
Heart disease (yes %)	13.0	11.3	9.8	11.7	11.3
Psychological distress (%)	9.0	14.5	12.5	13.5	10.6

Cardiorespiratory fitness [a]	28.7±6.4	25.2±5.2	23.6±5.2	25.3±5.1	24.1±5.1
Good health (%)	87.8	77.2	75.5	80.9	74.6
Prescription medications (%)	77.6	86.1	78.7	86.1	82.8
Current smoker (%)	8.5	12.5	16.3	13.2	13.2
Physical activity 30 min (%)	74.9	67.6	61.7	69.2	65.2
Grip strength (kg)	34.7±11.1	30.9±11.2	31.5±9.8	31.8±11.3	31.9±10.3
Good memory (%)	72.7	63.8	65.2	61.0	66.7

Values are presented as means ± SD or percentage distributions. [a] Cardiorespiratory fitness measured as VO_{2peak} (mL·kg^{-1}·min^{-1}).

Supplementary Table 1. Factors independently associated with dropout after 1- and 3-years (bivariate logistic regression)

Variables	**N (%)**	**Dropout 1-year OR (95% CI)**	**Dropout 3-years OR (95% CI)**
Age, yr			
70-72	860 (56.8)	1.00	1.00
73-76	654 (43.2)	1.36 (0.99, 1.88)	1.43* (1.07, 1.89)
Sex			
Men	746 (49.3)	1.00	1.00
Women	768 (50.7)	1.68** (1.21, 2.34)	1.56** (1.17, 2.07)
Education level			
High	742 (50.4)	1.00	1.00
Low	729 (49.6)	2.36** (1.67, 3.34)	2.04** (1.52, 2.75)
Living alone			
Yes	378 (25.5)	1.00	1.00
No	1105 (74.5)	1.24 (0.87, 1.78)	1.39* (1.02, 1.90)
Social support			
Yes	1328 (92.9)	1.00	1.00

No	101 (7.1)	1.14 (0.61, 2.14)	1.11 (0.64, 1.94)
BMI			
Normal weight	617 (41.2)	1.00	1.00
Overweight	882 (58.8)	1.47* (1.04, 2.07)	1.58** (1.16, 2.13)
Good health			
Yes	1276 (87.8)	1.00	1.00
No	178 (12.2)	2.50** (1.67, 3.74)	2.22** (1.53, 3.22)
Heart disease			
Yes	197 (13.0)	1.00	1.00
No	1317 (87.0)	1.26 (0.75, 2.11)	1.17 (0.76, 1.82)
Psychological distress			
No	1330 (91.0)	1.00	1.00
Yes	131 (9.0)	1.77* (1.08, 2.90)	1.59* (1.01, 2.49)
Good memory			
Yes	1006 (72.7)	1.00	1.00
No	378 (27.3)	1.56* (1.09, 2.23)	1.73** (1.26, 2.36)
Prescription medications			
No	308 (22.4)	1.00	1.00
Yes	1068 (77.6)	1.55 (0.98, 2.45)	1.77** (1.17, 2.66)
Current smoker			
No	1344 (91.5)	1.00	1.00
Yes	125 (8.5)	1.85* (1.13, 3.03)	1.84** (1.18, 2.86)
CRF (1 ml/min/kg lower)	1478	1.15** (1.11, 1.18)	1.14** (1.11, 1.18)
Grip strength (kg)			
Mean and above	740 (49.4)	1.00	1.00
Below mean	758 (50.6)	1.91** (1.36, 2.68)	1.52** (1.14, 2.03)

PA 30 min per day			
Yes	1060 (74.9)	1.00	1.00
No	355 (25.1)	1.65** (1.15, 2.36)	1.50* (1.09, 2.07)
Randomization			
Unsupervised exercise	755 (49.9)	1.00	1.00
Supervised exercise	759 (50.1)	2.47** (1.74, 3.49)	2.45** (1.81, 3.32)

OR, odds ratio; 95% CI, 95% Confidence Interval; BMI, Body mass index; CRF, Cardiorespiratory fitness, measured as VO_{2peak} (ml/min/kg); PA, physical activity. *p <0.05; **p <0.01.

Table 2. Multivariate logistic regression model of factors associated with dropout in exercise - after 1-year

Variables	**OR**	**95% CI**
Sex (woman)	1.48	(0.94, 2.33)
Education level (low)	2.34**	(1.54, 3.56)
Poor health	1.01	(0.58, 1.77)
Reduced memory	1.42	(0.92, 2.21)
Psychological distress	1.57	(0.85, 2.92)
BMI	1.06	(0.68, 1.67)
CRF (1 ml/min/kg lower)	1.16**	(1.11, 1.21)
Grip strength (below mean)	2.10**	(1.38, 3.19)
Current smoker	1.10	(0.56, 2.17)
< 30-min of PA per day	1.73*	(1.13, 2.66)
Supervised exercise	2.61**	(1.71, 3.98)

OR, odds ratio; 95% CI, 95% Confidence Interval; BMI, Body mass index; CRF, Cardiorespiratory fitness, measured as VO_{2peak} (ml/min/kg); PA, physical activity. *p <0.05; **p <0.01. Cox and Snell R^2 = 0.098.

Supplementary Table 2. Multivariate logistic regression model of factors associated with dropout in the unsupervised exercise group – after 3-years

Variables	**OR**	**95% CI**
Age	1.20	(0.62, 2.33)
Sex (woman)	1.70	(0.81, 3.54)
Education level (low)	2.31*	(1.16, 4.56)
Living alone	1.30	(0.60, 2.85)
Poor health	1.58	(0.71, 3.48)
Reduced memory	2.31*	(1.16, 4.60)
Prescription medications	1.52	(0.67, 3.44)
Psychological distress	1.35	(0.47, 3.86)
BMI (overweight)	1.15	(0.55, 2.44)
CRF (1 ml/min/kg lower)	1.21**	(1.12, 1.30)
Grip strength (below mean)	1.68	(0.84, 3.37)
Current smoker	1.24	(0.33, 3.82)
< 30-min of PA per day	1.50	(0.74, 3.05)

OR, odds ratio; 95% CI, 95% Confidence Interval; BMI, Body mass index; CRF, Cardiorespiratory fitness, measured as VO_{2peak} (ml/min/kg); PA, physical activity. *p <0.05; **p <0.01. Cox and Snell R^2 = 0.105.

Table 3. Multivariate logistic regression model of factors associated with dropout in exercise – after 3-years

Variables	**OR**	**95% CI**
Age	1.25	(0.86, 1.84)
Sex (woman)	1.39	(0.90, 2.14)

Education level (low)	2.19**	(1.49, 3.21)
Living alone	1.16	(0.75, 1.81)
Poor health	1.01	(0.60, 1.70)
Reduced memory	1.87**	(1.25, 2.81)
Prescription medications	1.26	(0.77, 2.05)
Psychological distress	1.31	(0.72, 2.39)
BMI (overweight)	1.11	(0.73, 1.68)
CRF (1 ml/min/kg lower)	1.18**	(1.13, 1.23)
Grip strength (below mean)	1.71**	(1.17, 2.52)
Current smoker	1.07	(0.55, 2.09)
< 30-min of PA per day	1.75**	(1.17, 2.63)
Supervised exercise	3.29**	(2.20, 4.92)

OR, odds ratio; 95% CI, 95% Confidence Interval; BMI, Body mass index; CRF, Cardiorespiratory fitness, measured as VO_{2peak} (ml/min/kg); PA, physical activity. *p <0.05; **p <0.01. Cox and Snell R_2 = 0.135.

Supplementary Table 3. Multivariate logistic regression model of factors associated with dropout in the supervised exercise group – after 3-years

Variables	**OR**	**95% CI**
Age	1.28	(0.80, 2.05)
Sex (woman)	1.27	(0.73, 2.18)
Education level (low)	2.11**	(1.32, 3.39)
Living alone	1.12	(0.66, 1.93)
Poor health	1.39	(0.69, 2.82)
Reduced memory	1.75*	(1.05, 2.91)

Prescription medications	1.15	(0.62, 2.13)
Psychological distress	1.30	(0.62, 2.70)
BMI (overweight)	1.09	(0.65, 1.82)
CRF (1 ml/min/kg lower)	1.17**	(1.10, 1.23)
Grip strength (below mean)	1.66*	(1.04, 2.66)
Current smoker	1.29	(0.55, 3.01)
< 30-min of PA per day	1.83*	(1.11, 3.04)

OR, odds ratio; 95% CI, 95% Confidence Interval; BMI, Body mass index; CRF, Cardiorespiratory fitness, measured as VO_{2peak} (ml/min/kg); PA, physical activity. *p <0.05; **p <0.01. Cox and Snell R^2 = 0.133.