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Health-related quality of life and sickness absence in community nursing home employees: randomized controlled trial of physical exercise

J. I. Brox[1] and O. Frøystein[2]

Background	It is a common belief that physical exercise at the workplace decreases subjective health complaints and reduces sickness absence, but this is not supported by previous randomized studies.
Aims	To evaluate the effectiveness of physical exercise at the workplace.
Methods	One hundred and twenty-nine employees in a community-based nursing home for the elderly were randomized into physical exercise or control groups. A weekly exercise class consisting of light aerobic exercise, muscle strengthening and stretching was held for a 6-month period. The control group was told to continue their ordinary activity. The main outcome measures were aerobic fitness (UKK walking test), health-related quality of life (COOP/WONCA) and sickness absence. Blinded assessments were carried out at baseline and following the 6-month intervention. Complete sickness absence data were collected from a community register for two comparable 7-month periods.
Results	The average number of exercise sessions was 12 (0–26). Self-reported physical activity increased in the intervention group compared with the control group ($P < 0.01$). Aerobic fitness improved in both groups ($P < 0.01$). Mean sickness absence increased from 6.8 to 15.6 days in the exercise group and from 10.4 to 14.5 in the control group. No differences between groups were found for aerobic fitness, health-related quality of life or sickness absence.
Conclusion	The intervention neither improved health-related quality of life nor reduced sickness absence.
Key words	Physical exercise; randomized controlled trial; sickness absence; worksite.

Introduction

In Norway, more than half of total doctor-certified sick leave is based on subjective statements from patients [1]. A recent Swedish study reported that in most cases sickness absence is determined by the patient [2]. It has been proposed that an illness behaviour culture has developed in Sweden and Norway, and that expectancies of sickness absence drive the system rather than actual sickness and work disability [3]. It is proposed that physical exercise and stress management at the workplace could reduce subjective health complaints and sickness absence, but a recent randomized controlled study reported no demonstrable effect from such intervention [4]. A systematic literature review on sickness absence and exercise at the workplace identified four randomized studies [5–8]. It was concluded that exercise at the workplace does not reduce sickness absence and the four studies cited a high dropout rate, ranging from 22 to 52% as a major factor. Two other randomized studies that were not identified by the original search parameters [9,10] found that exercise at the workplace significantly reduced sickness absence. These studies suggest that physical exercise at the workplace may reduce sickness absence, but that factors other than improved fitness contribute to the observed reduction. This suggestion agrees with studies of patients with depression reporting that non-aerobic forms of exercise are as effective as aerobic forms of exercise in the treatment of anxiety disorders and depression [11,12].

We assumed that physical exercise at the workplace might improve health-related quality of life and reduce sick leave. We conducted a randomized controlled study to evaluate the effectiveness of aerobic group exercise on aerobic fitness, health-related quality of life and sickness absence.

[1]Section for Back Surgery and Physical Medicine and Rehabilitation, Orthopaedic Department, National Hospital, 0027 Oslo, Norway.

[2]University of Sports and Physical Education, 0806 Oslo, Norway.

Correspondence to: J. I. Brox, Section for Back Surgery and Physical Medicine and Rehabilitation, Orthopaedic Department, National Hospital, 0027 Oslo, Norway. Tel: +47 23 076 029; fax: +47 23 076 010;
e-mail: jens.ivar.brox@rikshospitalet.no

Methods

All employees in a team-based community nursing home in a Norwegian town received information about the study and were invited to participate. The ethics committee for medical research in health region I of Norway approved the study. Of the total of 220 employees, 129 agreed to participate and gave their informed, signed consent (Figure 1). Ten patients (two from the intervention group and eight from the control group) were excluded from the study because they did not complete the baseline physical test. The characteristics of these participants did not differ from those included. The participants were entered into the exercise intervention group or the control group by concealed random allocation. This procedure was carried out by an external group at the Department of Biological and Medical Psychology, University in Bergen, Norway.

The fitness programme consisted of a weekly session of light group exercise lasting for 1 h. The participants could attend exercise classes held weekly at two different times. The intervention was founded on an aerobic fitness model [13] designed to improve cardiovascular fitness, muscle strength and flexibility. Experienced instructors supervised all classes. In addition, classes regarding physical exercise, nutrition and stress management were offered to the intervention group. No intervention was offered to the control group.

Blind assessments (walking test and questionnaire) were carried out at baseline and 6 months after the first day of the intervention. Sickness absence data were collected from the community insurance register.

The UKK (President Urhu Kaleva Kekkonen Institute for Health Promotion Research, Tampere, Finland) walking test was developed to determine cardiorespiratory fitness of healthy adults [14,15]. The test requires the individual to walk 2 km and a fitness index is calculated based on gender, age, body mass index, walking time and heart rate at the 2-km finish. The heart rate was recorded throughout the walk using an ambulatory telemetric cardiometer (Polar Vantage NV, Polar Electro OY, Finland). The subjects were advised to abstain from eating a heavy meal or smoking 2–3 h before the test and to refrain from strenuous physical effort and alcoholic beverages the day before. All participants walked for 5 min to warm up and get accustomed to the treadmill.

The COOP/WONCA (Co-operation-World Organization of Colleges Academics) charts are validated for use in primary health care and were used to evaluate health-related quality of life. Different charts assessed physical fitness, feelings, daily activity, social activities, overall health and change in health status. Each chart has a five-point scale: 1 = very good, 2 = good, 3 = moderate, 4 = bad and 5 = very bad [16,17].

The number of sick days was collected for all participants for two 7-month periods starting at the first of April both the year before and for the year of the intervention. Total sickness absence (days) included all self-certified sick days (up to four 3-day blocks per year) and doctor-certified sick leave [18]. Absence from work due to children's sickness or civic duties was not registered. Sickness absence for $<100\%$ of a working day was summed to give whole days.

Secondary outcome measures including leisure-time physical activity, subjective health complaints and job satisfaction were registered by a standardized questionnaire filled out at baseline and follow-up.

Statistical analysis

Our original intention was to recruit 160 participants, which, given a standard deviation of 6.2, would have provided 80% power at the 5% significance level to detect

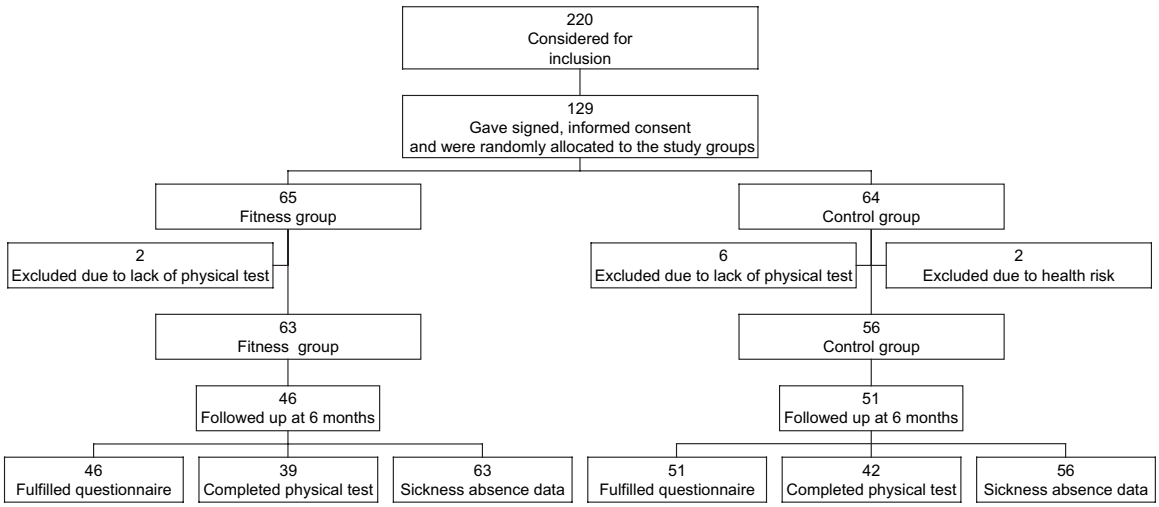

Figure 1. Recruitment and follow-up of study participants.

a 3-day (20%) difference in change in sickness absence between the two groups. Only 119 of the eligible employees (54%) participated in the study, reducing the power of the study. The primary analysis to detect differences between the groups was based on the principle of intention to treat. The Mann–Whitney rank sum test was applied to detect significant differences between groups. Proportions were compared by the Chi-square test, and the Wilcoxon test was used to assess intra-group differences.

Results

The characteristics of the participants are given in Table 1. Dropouts had lower professional education and were more likely to be daily smokers and sedentary.

Participants in the control group differed on the COOP/WONCA charts for daily activities, social activity and total sickness absence. Subjects in the intervention group attended an average of 12 (range 0–26) exercise sessions. Ten percent did not attend any session and 10% completed all sessions.

Performance on the UKK walking test improved significantly in both groups (Table 2). The difference between groups was 2.4 (95% confidence interval −2.1 to 7.0). The difference in improvement between 16 participants who attended at least 80% of the classes and those who participated less often was 6.7 (0.6–12.8).

COOP/WONCA charts did not demonstrate any change in physical fitness, overall health or self-perceived change in health status (Table 2). Social activity decreased in the control group ($P = 0.001$). For all categories, differences between groups were not significant, although there was a positive tendency in the intervention group for feelings ($P = 0.09$) and social activity ($P = 0.06$).

Sickness absence increased in both the intervention and control groups (Table 3) although the increase was significant only in the intervention group ($P = 0.03$). The difference between groups was 4.7 days (95% confidence interval −5.7 to 15.0) in favour of the control group. Self-certified sick days did not change for either group. The number of participants on long-term sick leave and the duration of sick leave periods increased in both groups.

Table 1. Demographic characteristics and baseline measures of the participants

	Exercise group		Control group	
	Included participants ($n = 63$)	Did not attend follow-up[a] ($n = 17$)	Included participants ($n = 56$)	Did not attend follow-up[a] ($n = 5$)
Patient characteristics				
Women	97%	94%	96%	100%
Mean age (years)	42.5	36.9	42.5	39.6
Body mass index (kg/m^2)	25.5	25.8	24.7	24.3
Married or cohabiting	69%	62%	88%	80%
Professional education <3 years	69%	82%	80%	80%
Daily smokers	48%	62%	48%	40%
No leisure-time physical activity	31%	60%	47%	41%
Medication weekly	25%	16%	16%	25%
Mean COOP/WONCA[b] scores				
Feelings	2.0	2.0	1.8	2.2
Physical fitness	2.3	2.3	2.3	2.8
Daily activity	1.5	1.3	1.4	2.6
Social activity	1.3	1.3	1.1	1.8
General health	2.2	2.2	2.2	2.6
Change in health	2.7	2.8	2.8	2.6
Health complaints				
Tiredness	20%	19%	19%	60%
Neck pain	27%	25%	35%	75%
Shoulder pain	25%	25%	35%	75%
Headache	10%	25%	7%	25%
Back pain	37%	38%	30%	40%
Mean UKK fitness test score	83.9	80.6	84.1	86.8
Job satisfaction	87%	94%	88%	80%
Sickness absence (mean days)[c]	6.8	6.6	10.4	62.0

Values are percentages unless stated otherwise.

[a]Complete follow-up data for sickness absence.

[b]COOP/WONCA: from 1 = very good to 5 = very bad.

[c]Mean sick days for the 7-month period the year before the intervention (April–November 1998).

Table 2. Mean (SD) scores for COOP/WONCA and UKK walking test before and after the intervention are given for the exercise and control group

	Exercise group		Control group		Difference	*P*-value
	Before (n = 45)	After (n = 39)[a]	Before (n = 49)	After (n = 42)[a]		
COOP/WONCA scores						
Physical fitness	2.3 (1.0)	2.5 (0.9)	2.3 (1.0)	2.4 (0.9)	0.1 (−0.3 to 0.4)	0.92
Feelings	2.0 (0.9)	1.8 (0.9)	1.9 (0.9)	2.0 (1.1)	0.4 (−0.1 to 0.8)	0.09
Daily activities	1.6 (0.8)	1.7 (1.0)	1.2 (0.5)	1.5 (0.8)	0.1 (−0.3 to 0.6)	0.39
Social activities	1.4 (0.7)	1.5 (0.9)	1.1 (0.3)	1.4 (0.1)	0.3 (−0.1 to 0.7)	0.06
Change in health	2.7 (0.6)	2.6 (0.8)	2.8 (0.5)	2.9 (0.1)	0.2 (−0.1 to 0.6)	0.19
Overall health	2.2 (0.7)	2.2 (0.9)	2.1 (0.6)	2.1 (0.7)	0.0 (−0.3 to 0.3)	0.66
UKK walking test[a]	86.2 (15.6)	94.4 (12.4)	85.2 (12.4)	90.9 (9.6)	2.4 (−2.1 to 7.0)	0.14

Means (95% confidence intervals) are given for the differences between groups from before to after the intervention. *P*-values for the difference in change from before to after the intervention were calculated using the Mann–Whitney test.

[a]Completed UKK walking test at follow-up.

Table 3. Mean (SD) number and days of self-certified sick days, doctor-certified sick leave and total sickness absence before and after treatment are given for the exercise and control group

	Exercise group (n = 63)		Control group (n = 56)		Difference	*P*-value
	Before	After	Before	After		
Self-certified						
Number	0.5 (0.7)	0.5 (0.7)	0.5 (0.8)	0.6 (0.7)	0.1 (−0.3 to 0.5)	0.56
Days	0.8 (1.2)	0.8 (1.3)	0.9 (1.7)	1.0 (1.3)	0.1 (−0.7 to 0.8)	0.55
Doctor-certified sick leave						
Number	0.7 (1.5)	1.7 (2.5)	1.2 (2.6)	1.7 (2.5)	0.5 (−0.5 to 1.6)	0.45
Days	6.0 (14.4)	14.7 (28.4)	9.4 (21.9)	13.4 (22.9)	4.7 (−5.8 to 15.3)	0.80
Total sickness absence						
Days	6.8 (14.6)	15.6 (28.4)	10.4 (22.0)	14.4 (22.9)	4.7 (−5.7 to 15.1)	0.64
Median days (range)	1.0 (0–65)	3.0 (0–152)	0.0 (0–115)	2.5 (0–110)		

Means (95% confidence intervals) are given for the differences between groups from before to after the intervention. *P*-values for the difference in change between groups from before to after the intervention were calculated with the Mann–Whitney test.

Self-reported physical activity for those who attended follow-up increased in 48% of the participants in the intervention group and 14% in the control group ($P < 0.01$). No differences were found in the frequency of reported headache, neck, shoulder or back pain between groups post-intervention.

Discussion

Our objective was to evaluate the effectiveness of an aerobic fitness programme in nurses and nurse aides. The observed results for health-related quality of life, aerobic fitness and sickness absence do not provide any evidence for the effectiveness of this programme. The mean difference in increase in sick days of 4.7 days in favour of the control group suggests that increasing the study sample had most likely not resulted in a benefit in terms of reduced sickness absence after the exercise intervention. Our results are in agreement with the conclusion of a systematic review and a just-published randomized study [4,5]. Another review reported a similar conclusion based on a meta-analysis that evaluated changes in activity habits and/or measured fitness test scores in 26 studies and 8800 workers [19]. Effects were weakest in studies that used a randomized design, relied on a health education/risk appraisal or were conducted within a major corporation rather than a university or public agency.

Despite enthusiastic encouragement, only 58% of the invited employees participated in the present study. The percentage attendance in the exercise classes was less than 50%, a finding that agrees with other studies that found low programme adherence [8]. Self-selection of subjects and the low participation rate may have biased results in favour of the intervention group. In addition, workers who had a lower education, were smokers or sedentary were more likely to drop out, suggesting that, in agreement with other studies [8], intervention did not change the behaviour in sedentary individuals. Previous studies have reported that intervention with a simple strategy such as walking appears to promote higher

adherence compared with other forms of aerobic activity [20]. The effectiveness of a weekly 20-min trunk-muscle-strengthening-programme in nurses and nurse aides supports the view that a simple approach is preferable [9]. Improved adherence was achieved in university employees who participated in aerobic training using a behavioural approach [20,21]. This suggests that the pedagogical aspects of promoting physical exercise in employees have been underestimated [22].

In this study, intervention had no effect on self-reported physical fitness, daily activities, health, change in health or subjective health complaints. The tendency for improvement in tiredness and feelings found in the intervention group agree with previous studies [7,23], but reductions in anxiety or depressive symptoms were not related to improved cardiovascular fitness [12].

The UKK walking test improved significantly in both groups. A possible explanation is that the participants were more confident with the treadmill at follow-up, thus attributing the improved performance to learning.

Sick leave was precisely recorded and seasonal variations in sickness absence were eliminated by comparing similar times of the year. We have no plausible explanation for the large increase in sickness absence. According to official Norwegian statistics, female health workers show the highest rate of sickness absence and in addition showed an increase from 10 days in 1994 to 14 days in 1998. Compared with these numbers, sickness absence recorded in this study was twice as high. Although the longest periods of sick leave were observed in dropouts, there was also an increase in those who adhered well to the fitness programme. This was not explained by any deterioration in health or job satisfaction, but we cannot exclude the possibility that dropouts were sedentary and out of work because they were depressed. In conclusion, our study found that fitness training neither improved health-related quality of life nor reduced sickness absence.

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Conflicts of interest

None declared.

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