Paper III

Improving health in health workers: A randomised controlled trial of physical exercise, health information, and stress management

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Abstract

Background: More than 50% of the sick leave is because of subjective health complaints. The work group with most sick leave is health workers. **Aims:** The aims of the study were to assess if an intervention consisting of physical exercise, health information, and stress management training would succeed in reducing sick leave and level of subjective health complaints in employees in a nursing home for the elderly. **Methods:** After a baseline screening the employees who had agreed to participate (n = 40) were randomised to an intervention and a control group. The intervention group was allowed by the employer to participate in an "Integrated Health Programme" twice weekly during working hours. The "Integrated Health Programme" consisted of physical exercise, stress management training, health information, and a visit at the actual work place of the participants. The control group was offered the same intervention after the project was finished. **Results:** There were no significant effects on sick leave or health related quality of life. The intervention group reported less neck complaints compared to the control group, otherwise there were no effects on subjective health complaints. But the subjective effects were large and highly significant, the intervention group reported improvement in health, physical fitness, muscle pain, stress management, maintenance of health, and work situation. **Conclusions:** The "Integrated Health Programme" was not effective in reducing sick leave and subjective health complaints, but increased the job satisfaction.

Key words: Randomised controlled trial, work place, sick leave, subjective health complaints, nursing personnel, physical exercise, stress management

Introduction

A high level of sick leave (1) and disability pension (2) is becoming an economic burden to the Norwegian society (3). The work group with the highest level of sick leave is nursing personnel (4) and nursing personnel also is the work group with the highest recruitment of disability pensioners (5).

Subjective health complaints are the cause of more than half of the sick leave in Norway (6). Subjective health complaints are conditions without objective pathological findings, or where the complaints are stronger than expected based on the objective findings (7). Musculoskeletal complaints is one group of subjective health complaints, pseudoneurology (i.e. tiredness, sleep problems, mood changes) and gastrointestinal complaints are others (7) . There is a high prevalence of subjective health complaints in Norway (8) and other European countries (9-14). Health workers report the highest level of subjective health complaints compared to other work groups (15). Musculoskeletal complaints alone are the cause of nearly half of the sick leave in Norway (6). Physical exercise is found to have positive effect on both complaints and sick leave from musculoskeletal complaints (16-19).

Nursing personnel is considered a high risk group for musculoskeletal complaints (20-22) and reports of musculoskeletal complaints are associated with reports of low health related quality of life (23). Physical exercise has been shown to reduce musculoskeletal symptoms (24) and the risk of sick leave (22, 25) in nursing personnel. However, other studies have not found physical exercise to be effective in reducing musculoskeletal symptoms in nursing personnel (26) or other working populations (27, 28). There is a negative association between musculoskeletal complaints and good coping skills (29).

The aims of this study were to assess if an "Integrated Health Programme" (28) would reduce sick leave and subjective health complaints, and increase coping in a population of nursing personnel. The "Integrated Health Programme" consisted of a combination of physical exercise, stress management, and health information, and was tested in a randomised, controlled study. The "Integrated Health Programme" was selected because it was the intervention with the best overall effect in a previous trial (28). Our hypotheses were: 1) The intervention group will have less musculoskeletal complaints and less sick leave compared to the control group. 2) The intervention group will increase their coping skills.

Method

Participants

In 2001 the personnel in a nursing home for the elderly in Norway, 62 employees working more than 49% of full time, were invited to participate in the project "An integrated health programme for employees in nursing homes for the elderly". Forty-five employees agreed to participate in the project. Baseline data were collected in September 2001. There were only 5 males in the study and they were excluded from the analyses as the number was too small to allow separate analyses. The participants were randomised to intervention (n = 19) or control (n = 21) group (see fig. 1). The intervention group was granted leave from work to participate in the intervention twice a week. Post-test was done in June 2002 when the intervention was finished.

Outcome measures

Main outcome measures were sick leave and subjective health complaints. Secondary outcome measures were coping, job stress, effort reward imbalance, demands, control, health related quality of life, and subjective effects of the intervention.

Intervention

The intervention group

The "Integrated Health Programme" (28, 30) consisted of three main parts, physical exercise, health information/stress management training, and a practical examination of the work place. The program was delivered by an aerobic instructor with health education (nurse). The physical exercise was based on a standardised aerobic dancing programme (30, 31) and was given for one hour three times a week for nine months. The program consisted of body awareness (5 minutes), warm-up/aerobic/ergonomics (25 minutes), circulation (5 minutes), strength/stabilising (10 minutes), stretching (10 minutes), and relaxation (5 minutes). The general aim of the programme was to improve physical capacity, muscle strength, and flexibility.

During the nine months of the intervention the participants were given 15 hours of information on stress, coping, health and lifestyle, and a practical examination of the work place. The information sessions were held once a week from September to December 2001, lasting 1 hour. Health and life style information focused on exercise, nutrition, sleep, smoking, activity, and musculoskeletal problems. The stress management training focused on both the positive and negative consequences of stress and how to cope with stress. Discussions were encouraged. In the practical examination of the work place the participants contributed with their own experiences of how to organise and cope with the job.

The control group

The control group participated in the pre- and post-tests. They were offered the intervention program after the intervention was finished, they were also granted leave from work to participate.

Randomisation

The randomisation was concealed and done in blocks of ten. The participants were stratified at their department level to secure the daily run of the departments as much as possible. The randomisation procedure was done with a table of random numbers and a list of the employees who had agreed to participate in the project. The administrative staff of the research group performed the randomisation. The research group had no knowledge of the participants. The participants were randomised after the initial screening and testing.

Lost to follow-up

Eleven persons did not meet for the post-test, 7 in the intervention group and 4 in the control group, a drop-out rate of 28%. In the intervention group 2 of the drop-out individuals were out of work on leave (family reasons) and 1 had been transferred to disability compensation. One individual never participated in the intervention at all. For the last 3 the reason for drop-out was unknown. Of the 4 drop-out individuals in the control group 3 were out of work on leave (family reasons) and 1 was sick listed.

Ethics

All participants were assigned an identification number and treated anonymously in all analyses. Before the start of the project the employees were informed about the project by the

management and the employee organisations. An information pamphlet describing the project was distributed. All participants signed an informed consent form and were informed about their rights according to the Helsinki declaration. The project was approved by the management of the nursing homes, the employee organisations, the Norwegian Data Inspectorate, and the Regional Ethics Committee.

Measurements

All participants in the intervention and control groups were given a brief health check and filled in a questionnaire on pre- and post-test. Data on sick leave from the year before the start of the intervention, the intervention year, and the year after the intervention was supplied from the nursing home.

All data were measured with Norwegian versions of questionnaires, covering a broad range of variables including demographic variables, life style, health related quality of life, subjective health complaints, coping, social support, and work variables.

Subjective health complaints (SHC) were measured by the SHC inventory (7). The inventory lists 29 items on subjective somatic and psychological complaints the previous 30 days. Severity was scored on a four-point scale, from 0 – no complaints, to 3 – severe complaints. Five subscales were computed, allergy (5 items), flu (2 items), musculoskeletal complaints (headache, neck pain, upper back pain, low back pain, arm pain, shoulder pain, migraine, and leg pain, 8 items), "pseudoneurology" (32) (palpitations, heat flushes, sleep problems, tiredness, dizziness, anxiety, and sadness, 7 items), and gastrointestinal complaints (heartburn, epigastric discomfort, ulcer/non-ulcer dyspepsia, stomach pain, gas discomfort, diarrhoea, and constipation, 7 items).

The generic health status inventory SF-36 for health situations during the last four weeks was used for measuring health related quality of life (33-35). The 36 items are grouped into eight factors, physical functioning, role limitations due to physical problems, role limitations due to emotional problems, bodily pain, social functioning, mental health, vitality, and general health perceptions. In addition, health transition over the past year was measured. The scoring of the items varied from dichotomous scales (yes/no) to six-point ordinal scales.

Adjusted SF-36 scores were calculated by using each individual's score on the eight SF-36 factors subtracting the age and gender specific normative score, dividing by the standard deviation in the general population, multiplying with 10 and adding 50 (34, 36). The mean is 50, and a deviation of 10 points from the mean represents one standard deviation. A low score is a score below 50 and implies low quality of life, a high score is a score above 50 and implies high quality of life.

Coping was measured by the Instrumental mastery oriented coping factor from the CODE (37), based on the Utrecht Coping List (UCL) (38, 39). Instrumental mastery oriented coping (active problem solving, avoidance and passive expectancy, and depressive reaction pattern) implies an instrumental, active, goal-oriented coping style, with strategies like direct intervention, considering different solutions to the problem, and considering the problem a challenge (37). To get a high coping score, the score on active problem solving must be high and the scores on avoidance and passive expectancy and on depressive reaction pattern must be low.

The psychological demands factor was measured by five questions from the short Swedish version (40) of the psychological demands dimension from the demand/control model (41). The items were scored on a four-point scale from 1 (yes, often) to 4 (no, nearly never), yielding a sum score for psychological demands. High demands are related to working hard and fast, excessive work, insufficient time for the work tasks, or conflicting demands.

Control (decision latitude) was measures by six items from the short Swedish version (40) of the decision latitude dimension from the demand/control model (41). Four items refer to skill discretion and two items to decision authority. The items were scored on a four-point scale from 1 (yes, often) to 4 (no, nearly never), yielding a sum score for control. High score means high level of control.

Subjective effects of the intervention were measured by seven items. The participants were asked what the intervention had meant to them by scoring the following statements on a five-point scale from 1 (much better) to 5 (much worse):

1. My health has become…
2. The work environment has become…
3. My physical fitness has become…
4. My work situation has become…
5. My muscle pain has become…
6. My management of stress has become…
7. My ability to maintain my health has become…

Analyses

All statistical analyses were performed with SPSS 13.0 for Windows. Differences between groups were assessed by one-way ANOVA and χ^2 tests. Risk ratios (RR) and 95% confidence intervals (CI) were calculated for the subjective effects of the intervention.

Results

Baseline characteristics

There were no significant differences between the participants in the intervention and control groups at baseline (see Table 1).

Participants lost to follow-up

The participants lost to follow-up were younger (mean 37 (95% CI 28.7 – 45.6)) than the participants who completed the study (mean 45 (95% CI 42.0 – 48.9), $F(1,38) = 5.4$, $p = .025$). There were no significant differences on sick leave at baseline (from September 2000 to September 2001, year 1), but the participants who completed the study had significantly fewer days of sick leave in the intervention year (from September 2001 to September 2002, year 2) (mean 25.6 (95% CI 8.4 – 42.8); $F(1,37) = 4.3$, $p = .045$) and the year after the intervention (from September 2002 to September 2003, year 3) (mean 38.4 (95% CI 14.9 – 61.9); $F(1,31) = 6.0$, $p = .020$) than those lost to follow-up. Otherwise there were no significant differences on any demographic or outcome variables at baseline between the participants who completed the study and those who were lost to follow-up.

Effects of the intervention

There were no significant differences between the intervention and control groups regarding sick leave (see Table 1). Number of days of sick leave increased by a factor of 2.6 in the study population from the year before the intervention (mean 20 (95% CI 11 – 30)) to one year post intervention (mean 53 (95% CI 28 – 79)).

There were no significant differences between the intervention and control groups on subjective health complaints sum scales, coping, job stress, effort reward imbalance, demands, control or any of the SF-36 scales (see Table 1). The intervention group reported less neck complaints than the control group (8% versus 48% reported substantial complaints (score above 1), $\chi^2 = 5.2$, p = .023). There were no differences on reports of complaints in the upper back (15% versus 13% reported substantial complaints, $\chi^2 = 0.024$, p = .877) or the low back (8% versus 13% reported substantial complaints, $\chi^2 = 0.179$, p = .672).

There were significant differences between the intervention and control groups on subjective effects (see Table 2). The intervention group reported that their health, physical fitness and work situation had become better, they had less muscle pain, were better at stress management and better at maintaining their health than the control group. On reports of how the project had influenced their work environment, there were no differences between the groups. We registered no negative effects of the intervention.

Discussion

There were no significant effects of the intervention on sick leave, subjective health complaints sum scales, health related quality of life, stress or coping. Complaints in the neck

were significantly better after the intervention in the intervention group compared to the control group, but there were no differences between the groups regarding complaints in the upper and low back. The subjective effects of the health and well-being of the participants were significantly better in the intervention group than in the control group.

Mean number of days of sick leave per year in the study population more than doubled during the three years of measurement. There was an increase in sick leave for Norwegian employees in the health sector in the same period, but much smaller, level of sick leave increased from 9.8% to 10.5% (4). Why the study nursing home had such a large increase in sick leave is difficult to explain. It may have been a coincidence or some of the explanation may lie in organisational matters. The intervention may have contributed by increasing the work load of the control group, but then the increase in sick leave should have been in the control group only. This explanation is not supported in the process evaluation of the project (42). The informants reported that majority of the employees regardless of being in the intervention or the control group were positive to the project and made an effort to make the work run as smoothly as possible. If the intervention itself was harmful to the participants, one would not expect to see an increase in the control group.

The intervention group reported significantly less neck complaints after the intervention compared to the control group. This is in accordance with the results from a Finnish work place exercise intervention (43) and also with the conclusions of previous reviews on physical exercise and neck complaints (17, 44). Otherwise there was no significant difference between the intervention and control groups regarding subjective health complaints. However, when asked if the project had had any positive or negative effects, there were large significant differences between the intervention and control groups, the intervention group reporting

improvement in health, physical fitness, muscle pain, stress management, maintenance of health, and work situation. This is in accordance with the findings in an earlier study of employees in the Norwegian postal service (28). One interpretation of these seemingly conflicting results may be that the participants in the intervention group have learned effective ways of coping with the complaints and accordingly think the complaints have improved. Successful conservative treatment of low back pain seeks to reduce pain related fear of movement and tries to get the message across that activity may be painful, but not harmful (45, 46). Participating in physical exercise may have helped the intervention group to experience that even if it is painful, activity does not make the complaints worse in the long run and accordingly they pay less attention to the complaints and are more satisfied because the complaints do not hamper them in their daily activities. This is in accordance with the fear avoidance model (47).

However, there was no difference in coping measured as instrumental mastery oriented coping (37) between the groups. If better coping is one way of explaining the incongruence of the lack of effect seen on reports of subjective health complaints and the large subjective effects, it is an aspect of coping not caught by the coping scale we used (37).

So the intervention did have a positive effect on the perception of the health and well-being of the participants, but not on the actual level of sick leave, complaints or stress. The groups were small and the number of drop-outs high, implying that large effects are needed to show significant results. There may have been a prophylactic effect; follow-up time was not long enough to capture that. Recent research has shown job satisfaction to be an important predictor of health of employees (48). This variable was not measured in our study, but the employees in the intervention group reported a significantly better work situation after the

intervention period than their colleagues in the control group. This may be interpreted as an improvement in job satisfaction and thereby supporting the suggestion of a prophylactic effect.

The number of individuals who dropped out of the study is a major concern. Drop-out may be selective and in our study the drop-outs were younger and had more sick leave than the individuals who completed the study. It may be that the individuals who need an intervention like this most, choose not to participate in the study or will drop out of it, the higher level of sick leave in the drop-out group points in this direction.

There was no support for our hypothesis that the intervention group would have less musculoskeletal complaints and lower level of sick leave than the control group. Our second hypothesis of an increase in coping skills in the intervention group was based on the negative association between subjective health complaints and coping (29), and was not supported, as would be expected because of the lack of reduction of subjective health complaints.

Conclusion

The "Integrated Health Programme" may be recommended to employers who want to increase job satisfaction and well-being among their employees. Even if there were no positive effects of the intervention on sick leave, stress, and subjective health complaints, the results point in a positive direction. Seen together with the large subjective effects, further and larger studies seem to be indicated. These studies should be of long enough duration to show possible prophylactic effects of this type of intervention.

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Reference List

1. National Insurance Administration. Days of sick leave 1996-2005. The National Insurance Administration; 2006.
2. National Insurance Administration. Disability pensions 1996-2005. The National Insurance Administration; 2006.
3. National Insurance Administration. Costs of benefits 1996-2006. The National Insurance Administration; 2006.
4. Statistics Norway. Sick leave 2001-2005. Statistics Norway; 2006.
5. Norges offentlige utredninger. NOU 2004: 1. Modernisert folketrygd Statens forvaltningstjeneste, informasjonsforvaltning; 2004.
6. National Insurance Administration. Trygdestatistisk årbok 2005 (Statistical yearbook 2005). The National Insurance Administration; 2005.
7. Eriksen HR, Ihlebæk C, Ursin H. A scoring system for subjective health complaints (SHC). Scand J Public Health. 1999;1:63-72.
8. Ihlebaek C, Eriksen HR, Ursin H. Prevalence of subjective health complaints (SHC) in Norway. Scand J Public Health. 2002;30(1):20-9.
9. Eriksen HR, Svendsrød R, Ursin G, Ursin H. Prevalence of Subjective Health Complaints in the Nordic European Countries in 1993. Eur J Public Health. 1998;8(4):294-8.
10. Agreus L. The epidemiology of functional gastrointestinal disorders. Eur J Surg Suppl. 1998(583):60-6.
11. Kind P, Dolan P, Gudex C, Williams A. Variations in population health status: results from a United Kingdom national questionnaire survey. BMJ. 1998;316(7133):736-41.
12. Bassols A, Bosch F, Campillo M, Canellas M, Banos JE. An epidemiological comparison of pain complaints in the general population of Catalonia (Spain). Pain. 1999;83(1):9-16.

13. Makela M, Heliovaara M, Sainio P, Knekt P, Impivaara O, Aromaa A. Shoulder joint impairment among Finns aged 30 years or over: prevalence, risk factors and co-morbidity. Rheumatology (Oxford). 1999;38(7):656-62.
14. Picavet HS, Hazes JM. Prevalence of self reported musculoskeletal diseases is high. Ann Rheum Dis. 2003;62(7):644-50.
15. Ihlebæk C, Eriksen HR. Occupational and social variation in subjective health complaints. Occup Med (Lond). 2003;53(4):270-8.
16. Tveito TH, Hysing M, Eriksen HR. Low back pain interventions at the workplace: a systematic literature review. Occup Med (Lond). 2004;54(1):3-13.
17. Linton SJ, van Tulder MW. Preventive interventions for back and neck pain problems: what is the evidence? Spine. 2001;26(7):778-87.
18. Waddell G, Burton AK. Occupational health guidelines for the management of low back pain at work: evidence review. Occup Med (Lond). 2001;51(2):124-35.
19. Busch A, Schachter CL, Peloso PM, Bombardier C. Exercise for treating fibromyalgia syndrome. Cochrane Database Syst Rev. 2002(3):CD003786.
20. Kaplan RM, Deyo RA. Back pain in health care workers. Occup Med. 1988;3(1):61-73.
21. Ljungberg AS, Kilbom A, Hagg GM. Occupational lifting by nursing aides and warehouse workers. Ergonomics. 1989;32(1):59-78.
22. Eriksen W. The prevalence of musculoskeletal pain in Norwegian nurses' aides. Int Arch Occup Environ Health. 2003;76(8):625-30.
23. Tveito TH, Passchier J, Duivenvoorden HJ, Eriksen HR. Subjective health complaints and health related quality of life in a population of health care workers. Psychol Health. 2004;19(2):247-59.
24. Alexandre NM, de Moraes MA, Correa Filho HR, Jorge SA. Evaluation of a program to reduce back pain in nursing personnel. Rev Saude Publica. 2001;35(4):356-61.
25. Gundewall B, Liljeqvist M, Hansson T. Primary prevention of back symptoms and absence from work. A prospective randomized study among hospital employees. Spine. 1993;18(5):587-94.
26. Oldervoll LM, Ro M, Zwart JA, Svebak S. Comparison of two physical exercise programs for the early intervention of pain in the neck, shoulders and lower back in female hospital staff. J Rehabil Med. 2001;33(4):156-61.
27. Pernold G, Mortimer M, Wiktorin C, Tornqvist EW, Vingard E. Neck/shoulder disorders in a general population. Natural course and influence of physical exercise: a 5-year follow-up. Spine. 2005;30(13):E363-8.
28. Eriksen HR, Ihlebaek C, Mikkelsen A, Gronningsaeter H, Sandal GM, Ursin H. Improving subjective health at the worksite: a randomized controlled trial of stress management training, physical exercise and an integrated health programme. Occup Med (Lond). 2002;52(7):383-91.
29. Eriksen HR, Ursin H. Subjective health complaints: is coping more important than control? Work and stress. 1999;13(3):238-252.
30. Eriksen HR, Ellertsen B, Grønningsæter H, Nakken KO, Løyning Y, Ursin H. Physical exercise in women with intractable epilepsy. Epilepsia. 1994;35(6):1256-64.
31. Bø K, Kamhaug EL. Gymnastikk i tiden. Oslo: Norges gymnastikk og turnforbund. Universitetsforlaget; 1989.
32. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). 4th ed. Washington, DC: American Psychiatric Association; 1994.

33. Ware JE, Gandek B, IQOLA Project Group. The SF-36 health survey: development and use in mental health research and the IQOLA Project. Int J Ment Health. 1994;23(2):49-73.
34. Ware JE, Snow KK, Kosinski M, Gandek B. SF-36 Health Survey: Manual and Interpretation Guide. Lincoln, RI: QualityMetric Incorporated; 2000.
35. Loge JH, Kaasa S, Hjermstad MJ, Kvien TK. Translation and performance of the Norwegian SF-36 Health Survey in patients with rheumatoid arthritis. I. Data quality, scaling assumptions, reliability, and construct validity. J Clin Epidemiol. 1998;51(11):1069-76.
36. Loge JH, Kaasa S. Short form 36 (SF-36) health survey: normative data from the general Norwegian population. Scand J Soc Med. 1998;26(4):250-8.
37. Eriksen HR, Olff M, Ursin H. The CODE: A revised battery for coping and defense and its relations to subjective health. Scand J Psychol. 1997;38:175-82.
38. Schreurs PJG, Tellegen B, Van De Willige G, Brosschot JF. De Utrechtse Coping Lijst: Handleiding. Lisse: Swets en Zeitlinger; 1988.
39. Schreurs PJG, Van De Willige G, Brosschot JF, Grau G. De Utrechtse Copinglijst: UCL. Handleiding. Lisse: Swets en Zeitlinger; 1993.
40. Theorell T, Michélsen H, Nordemar R, Stocholm Music 1 Study Group. Tre arbeidsmiljöindex som använts i Stockholmsundersökningen 1. In: Hagberg M, Hogstedt C, editors. Stockholmsundersökningen 1Data från en tvärsnittsundersökning av ergonomisk og psykosocial exponering samt sjuklighet och funktion i rörelsesorganen. Stockholm: MUSIC Books; 1991. p. 150-4.
41. Karasek R, Theorell T. Healthy work: Stress, productivity, and the reconstruction of working life. New York: Basic Books, Inc., Publishers; 1990.
42. Sivertsen MV, Saksvik PØ. En prosessevaluering av "Effekt av riktig kroppsbruk - et integrert tiltak i pleie- og omsorgssektoren for å forebygge og redusere helseplager". NTNU, Psykologisk institutt; 2002.
43. Sjogren T, Nissinen KJ, Jarvenpaa SK, Ojanen MT, Vanharanta H, Malkia EA. Effects of a workplace physical exercise intervention on the intensity of headache and neck and shoulder symptoms and upper extremity muscular strength of office workers: a cluster randomized controlled cross-over trial. Pain. 2005;116(1-2):119-28.
44. Kay TM, Gross A, Goldsmith C, Santaguida PL, Hoving J, Bronfort G. Exercises for mechanical neck disorders. Cochrane Database Syst Rev. 2005(3):CD004250.
45. Hagen EM, Eriksen HR, Ursin H. Does early intervention with a light mobilization program reduce long-term sick leave for low back pain? Spine. 2000;25(15):1973-6.
46. Indahl A, Velund L, Reikeraas O. Good prognosis for low back pain when left untampered. A randomized clinical trial. Spine. 1995;20(4):473-7.
47. Vlaeyen JW, Linton SJ. Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. Pain. 2000;85(3):317-32.
48. Faragher EB, Cass M, Cooper CL. The relationship between job satisfaction and health: a meta-analysis. Occup Environ Med. 2005;62(2):105-12.

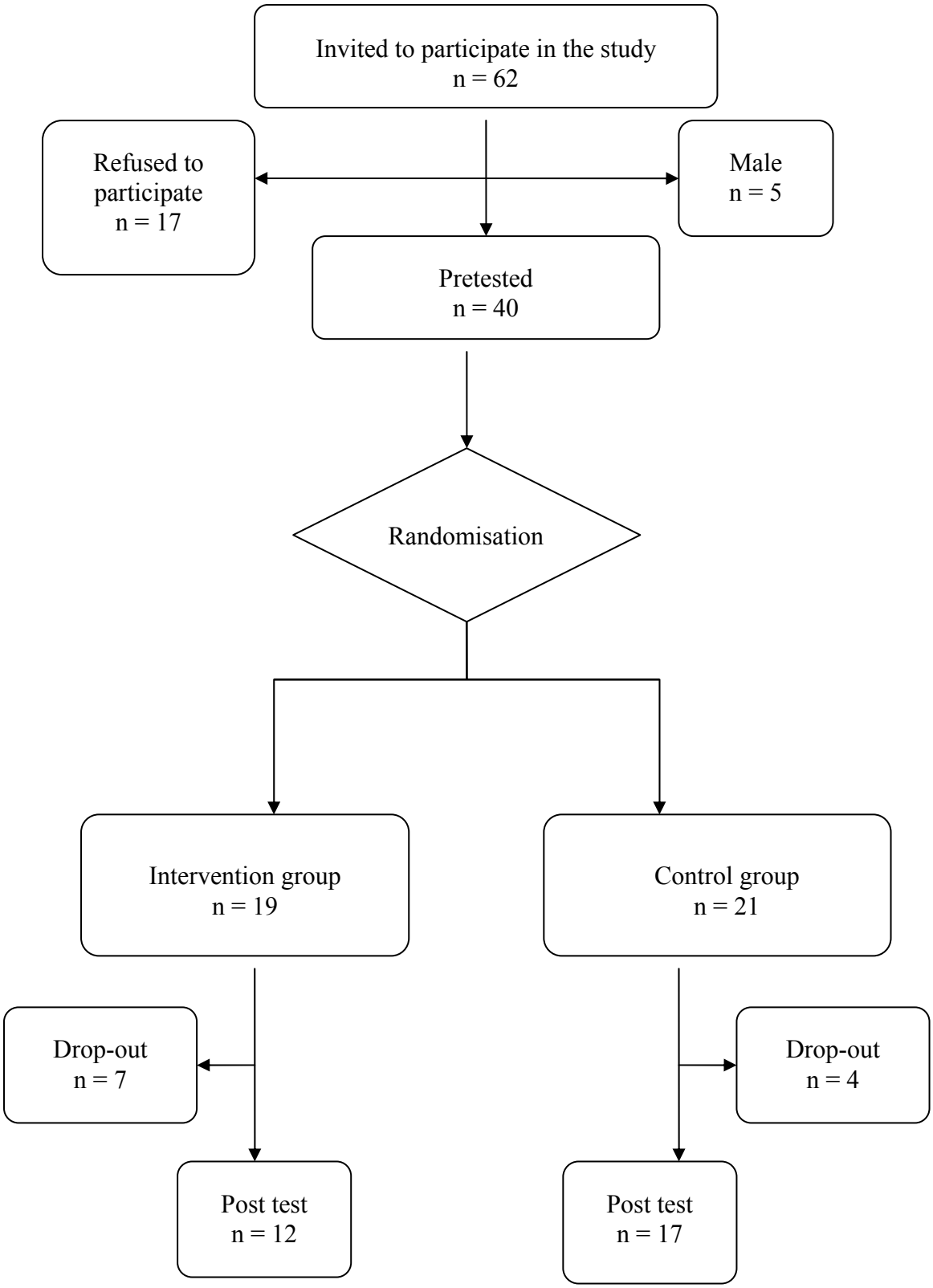

Figure 1. Flow chart

Table 1. Differences between the groups at baseline and post-test

	Intervention group (n = 19)	Control group (n = 21)	
Sick leave			
Baseline	19.7 (5.7 – 33.7)*	20.6 (6.5 – 34.7)	F(1,38) = .008, p = .931
Post-test	36.0 (5.2 – 66.8)	35.2 (14.1 – 56.2)	F(1,37) = .002, p = .963
1 year follow-up	52.6 (12.8 – 92.3)	54.4 (16.8 – 91.9)	F(1,31) = .005, p = .945
Musculoskeletal complaints			
Baseline	5.6 (3.4 – 7.7)	5.7 (3.6 – 7.7)	F(1,38) = .003, p = .955
Post-test	3.5 (0.9 – 6.2)	5.5 (3.4 – 7.7)	F(1,27) = 1.580, p = .220
Pseudoneurological complaints			
Baseline	4.2 (2.8 – 5.6)	2.7 (1.8 – 3.5)	F(1,38) = 4.036, p = .052
Post-test	2.8 (1.1 – 4.5)	2.5 (1.2 – 3.8)	F(1,27) = .094, p = .761
Gastrointestinal complaints			
Baseline	1.5 (0.7 – 2.2)	1.6 (0.8 – 2.4)	F(1,38) = .077, p = .783
Post-test	0.8 (0.1 – 1.6)	1.7 (0.8 – 2.6)	F(1,27) = 2.069, p = .162
Coping			
Baseline	3.1 (3.0 – 3.2)	3.0 (2.9 – 3.1)	F(1,38) = 2.126, p = .153
Post-test	3.0 (2.9 – 3.2)	3.0 (2.9 – 3.1)	F(1,27) = .026, p = .872
Jobstress			
Baseline	23.7 (15.6 – 31.9)	26.9 (19.6 – 34.2)	F(1,38) = .361, p = .552
Post-test	22.1 (14.7 – 29.6)	28.5 (18.6 – 38.4)	F(1,27) = 1.119, p = .299
Effort reward imbalance **			
Baseline (n = 35)	27%	15%	χ^2 = .729, p = .393
Post-test (n = 24)	18%	15%	χ^2 = .034, p = .855
Demands			
Baseline	14.6 (13.4 – 15.8)	14.2 (12.9 – 15.5)	F(1,38) = .199, p = .658
Post-test	14.5 (12.6 – 16.5)	14.3 (12.8 – 15.8)	F(1,27) = .041, p = .842
Control			
Baseline	17.1 (16.3 – 17.9)	17.8 (16.7 – 18.9)	F(1,37) =1 .047, p = .313
Post-test	17.4 (16.2 – 18.5)	17.6 (16.3 – 19.0)	F(1,27) = .100, p = .754
Physical functioning			
Baseline	48.1 (44.7 – 51.5)	49.5 (45.9 – 53.1)	F(1,36) = .353, p = .556
Post-test	49.9 (44.1 – 55.7)	49.1 (43.2 – 55.0)	F(1,27) = .039, p = .845
Role physical			
Baseline	49.8 (45.2 – 54.5)	47.8 (42.4 – 53.1)	F(1,37) = .355, p = .555
Post-test	50.0 (44.2 – 55.9)	48.9 (43.6 – 54.3)	F(1,27) = .085, p = .773
General health			
Baseline	42.3 (37.8 – 46.8)	45.7 (41.7 – 49.7)	F(1,38) = 1.374, p = .248
Post-test	49.4 (43.5 – 55.3)	44.7 (38.1 – 51.2)	F(1,27) = 1.264, p = .271
Bodily pain			
Baseline	46.9 (41.5 – 52.3)	45.6 (41.3 – 49.9)	F(1,38) = .163, p = .689
Post-test	49.9 (43.3 – 56.4)	45.3 (39.4 – 51.3)	F(1,27) = 1.201, p = .283
Vitality			
Baseline	44.9 (40.1 – 49.7)	47.3 (42.2 – 52.4)	F(1,38) = .517, p = .477
Post-test	48.6 (43.5 – 53.7)	48.5 (42.5 – 54.6)	F(1,26) = .000, p = .991
Social functioning			
Baseline	45.2 (40.1 – 50.3)	49.3 (45.5 – 53.1)	F(1,38) = 1.873, p = .179
Post-test	50.4 (46.0 – 54.7)	48.5 (42.9 – 54.1)	F(1,27) = .294, p = .592
Role emotional			
Baseline	51.0 (45.8 – 56.3)	50.9 (46.4 – 55.3)	F(1,37) = .003, p = .954
Post-test	51.3 (47.1 – 55.6)	49.4 (43.3 – 55.5)	F(1,27) = .287, p = .596
Mental health			
Baseline	47.3 (42.7 – 51.9)	49.8 (45.9 – 53.7)	F(1,38) = .762, p = .388
Post-test	52.9 (48.4 – 57.3)	52.9 (49.4 – 56.4)	F(1,26) = .001, p = .976

* Mean (95% CI)

** Differences tested with χ^2 tests. Percentage of participants with effort reward imbalance. All other differences were tested with one-way ANOVA.

Table 2. Risk ratios (95% Confidence Intervals) for subjective effects.

	RR (95% CI) n = 27
Better health	
Control group	1
Intervention group	3.3 (1.3 – 8.0)
Better work environment	
Control group	1
Intervention group	1.5 (0.7 – 3.2) n.s.
Better physical fitness	
Control group	1
Intervention group	11.1 (1.7 – 74.1)
Better work situation	
Control group	1
Intervention group	2.2 (1.1 – 4.2)
Less muscle pain	
Control group	1
Intervention group	3.2 (1.5 – 7.0)
Better stress management	
Control group	1
Intervention group	2.5 (1.3 – 4.8)
Better health maintenance	
Control group	1
Intervention group	2.8 (1.1 – 6.9)