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NO SIGNIFICANT DIFFERENCES BETWEEN INTERVENTION PROGRAMMES ON NECK, SHOULDER AND LOW BACK PAIN: A PROSPECTIVE RANDOMIZED STUDY AMONG HOME-CARE PERSONNEL

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The effects of two different prevention programmes on: (1) reported neck, shoulder and back pain, (2) perceived physical exertion at work and perceived work-related psychosocial factors, were evaluated by questionnaires after 12 and 18 months. Female nursing aides and assistant nurses ($n = 282$) working in the home-care services, were randomly assigned to one of three groups for: (1) individually designed physical training programme, (2) work-place stress management, (3) control group. Results revealed no significant differences between the three groups. However, improvements in low back pain were registered within both intervention groups for up to 18 months. Perceived physical exertion at work was reduced in the physical training group. Improvements in neck and shoulder pain did not differ within the three groups. Dissatisfaction with work-related, psychosocial factors was generally increased in all groups. As the aetiology of neck, shoulder and back disorders is multifactorial, a combination of the two intervention programmes might be preferable and should be further studied.

Key words: women, randomized, low back, physical training, stress management, outcome, prevention, musculoskeletal disorders, occupational health.

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The aetiology of work-related neck, shoulder and back disorders is multifactorial. Ergonomic factors such as heavy physical work (1, 2) have been documented to be related to neck and back pain, as are also psychosocial factors at work, for example high psychological demands, low decision latitude, lack of time and of social support (1, 3–5). Compared with single risk factors, a combination of ergonomic factors and a poor psychosocial environment, related and not related to work, reinforces the risk of neck and back disorders (4–7). Nursing is found to be a high-risk occupation concerning musculoskeletal disorders and back accidents (4, 8 9). Among female nursing aides perceived physical exertion has been indicated to be a risk for reporting low back pain (5).

Results of studies on the relation between physical fitness and neck, shoulder and back disorders are contradictory. Light exercise has been found to enhance the effect of other regimens in the prevention of low back pain (10). Moderate exercise was shown to be positive in the prevention of musculoskeletal symptoms among nursing personnel (11). In a review article, Campello et al. (12) found it difficult to draw any conclusions about the effect of exercise in the prevention of low back pain, due to a lack of well-designed, prospective studies. However, the literature yielded some evidence that exercise benefits the patient with non-specific, low back pain after the acute phase (12). In conclusion, physiological, psychological and social factors have been reported to interact with neck, shoulder and back problems.

The objectives of the present study were to evaluate and compare the effects of two different intervention programmes in working home-care personnel on: (1) reported neck, shoulder and back pain, (2) intermediate indicators such as perceived physical exertion at work and perceived work-related psychosocial factors. These objectives were based on the following hypotheses:

(1) An individually designed physical training programme promotes adherence to the programme, reduces fear-avoidance of muscular activity and of perceived physical exertion and consequently decreases the risk of developing neck, shoulder and/or back disorders.
(2) Training in a work-place stress management group enhances awareness of the association between psychosocial factors and musculoskeletal disorders, promotes empowerment, and consequently decreases the risk of developing neck, shoulder or/and back disorders.

SUBJECTS AND METHODS

Study design

The municipal home-care services were organized in six units situated in different, geographically defined areas of a medium-sized city in southern Sweden. Five of these units were included in the present study (one was excluded due to participation in another study). To avoid interference bias between the programmes, the randomization comprised two steps: (1) all work places at each unit were randomized to one of three different groups, namely, the Individual Physical Training Group (IT), the Stress Management Group (SM) and the Control Group, which received no intervention. (2) Individuals were randomly assigned from the designated work-places and invited to participate. Consequently all the three programmes were represented to the same extent in each unit.

Initially all subjects answered the questionnaires. They also underwent a physical examination (which will be reported elsewhere). This was repeated after 12 and 18 months. Physical examinations and intervention programmes were conducted by three experienced physiotherapists. The questionnaires were administrated by the project nurse, who was not involved in the intervention programmes, and blinded to group allocation. All activities in the project were performed during working hours and were recompensed. The project was administered by the municipal authority, trade union and the social

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Table I. *Demographic data, percentage of subjects smoking regularly, and percentage of neck, shoulder and back disorders at baseline**

	IT $n = 90$	SM $n = 93$	Control $n = 99$
Age			
Mean	43	45	44
(range)	(24–62)	(23–62)	(27–60)
Degree of employment			
Full time (≥95%)	25%	39%	33%
Part time (50–94%)	75%	62%	67%
Years of employment			
≤10 years	31%	19%	25%
>10 years	69%	81%	75%
Adults at home (≥18 years)			
Single	32%	21%	25%
2 persons	51%	74%	58%
3 or more persons	17%	6%	17%
Children at home			
1 or 2 children	41%	37%	42%
3 or more children	3%	3%	6%
Smoking regularly (>5 cigarettes/week)	42%	43%	47%
Pain at any time during the preceding 12 months			
Neck	54%	61%	59%
Shoulders	64%	68%	63%
Upper back	34%	25%	29%
Lower back	62%	60%	59%
Incapacitating pain at any time during the preceding 12 months			
Neck	11%	14%	12%
Shoulders	14%	14%	15%
Upper back	6%	6%	4%
Lower back	17%	11%	13%

* No significant differences between the groups were obtained.
IT: Individual Training Group, SM: Stress Management Group.

insurance office. It was implemented at all levels of the home-care organization. The participants gave their written, informed consent before participation.

The project was approved by the Ethical Committee of the Faculty of Medicine, University of Lund, Sweden.

Study population

Female nursing aides and assistant nurses working in the home-care service for elderly or handicapped people were invited to participate in the study. The inclusion criteria were: Swedish speaking, permanently employed, on duty and working at least 50% of full time, not pregnant and not suffering from an intercurrent disease, which could interfere with the results. In all, 659 women were invited to participate and 534 (81%) accepted. The main reasons not to participate were: the opinion that the project was important only for younger staff, dissatisfaction with the work situation, participating in compulsory, further education for nursing aides to qualify as assistant nurses, lack of time or family reasons. Due to the resources available, only 282 of the 534 persons were randomly selected for the two intervention programmes and the control group. Practically all nursing aides and assistant nurses had learned work technique (principles of transferring, repositioning, and lifting patients) in conjunction with the beginning of our intervention. Sick leave due to neck, shoulder and/or back pain during the preceding 12 months was reported by 13% ($n = 37$) of the participants. Demographic data and baseline statistics are summarized in Table I.

Dropouts

The number of participants at baseline and the number of women participating in all follow-ups are presented in Table II. The main known causes for dropping out were being involved in compulsory further education ($n = 20$) or not being able to fill in the questionnaires in time, mainly due to vacations ($n = 36$). Other known causes were pregnancy, retirement from work and illnesses not related to back pain. The proportion of dropouts was 30% for known causes and 10% for unknown causes or unwillingness to participate. Totally 169 subjects participated at both the 12- and 18-month follow-ups.

At baseline, dropouts from the SM group, compared with participants of the same group, were significantly more dissatisfied with their influence on and control over their work ($p = 0.03$) and supervisor climate ($p = 0.02$). Dropouts in the control group were more dissatisfied concerning relations with fellow workers ($p = 0.02$) compared with participants from the same group. Dropouts in the SM group also reported more pain from the upper back during the preceding 12 months compared with the participants in this group ($p = 0.04$). Otherwise, no significant differences were shown at baseline between the participants and the dropouts of any of the groups.

Intervention programmes

1. Individual Physical Training Programme (IT). Initially, the participants underwent a clinical physical examination. In connection with this examination each one received an individually designed training programme based on the results of the examination. In order to enhance adherence, the programme and how to fit it into everyday life, was thoroughly discussed with the participant. The exercises were thus individually adapted and individual goals were formulated. The majority of the specific exercises were taken from a manual specially designed for this purpose (Appendix). The participants were asked to make notes in a diary every time they did their exercises and every time they exercised for cardiovascular fitness for more than 20 minutes and perceived the training "somewhat hard". The programme and the diary were followed up after about 1 and 2 weeks, after 3 months and in connection with a further physical examination after 6 months.

2. Stress Management Programme in Groups (SM). The purpose of this intervention was primarily to identify and reach goals and strategies for perceived stress induced by lack of social support, low decision latitude/work control, and perceived high psychological work load. The intervention was based on group instruction. Each group consisted of participants from one work place. In all, 12 groups were involved. The numbers of participants in each group varied between 5 and 12. Every group met 7 times over a period of 7 weeks, each time for 1.5 hours. Two follow-ups were carried out after about 3 and 6 months. The meetings covered both theory and practice. An important part involved interactive talks among the participants concerning their experience of stress in general and at work, and how to handle these problems.

At the seventh meeting a stress-reducing goal for the entire workplace was formulated by the participants. The aim was to fulfil the goal at the follow-up 3 months later. Furthermore, the participants formulated an individual goal in order to reduce perceived stress at work and/or at home. The goal was to be concrete and attainable within 6 months. (More details of the programme are obtainable from E.H.). The immediate supervisors were invited to join the sixth or/and the seventh meeting if the participants agreed.

3. The Non-Intervention Group (Control). This group was to function as a check for environmental changes during the follow-up period. Participants were requested to live as usual. If, however, the physical examination indicated a condition which could risk the participant's further health, e.g. increased blood pressure or severe musculoskeletal disorders, she was recommended to contact a physician.

Data collection

The instruments consisted of questionnaires previously tested for validity and reliability and a few additional questions specially developed for the present study.

Musculoskeletal disorders. Neck, shoulder and back symptoms were assessed by the general Nordic Musculoskeletal Questionnaire (NMQ) about pain, aches or discomfort from neck, shoulders, upper and lower back (13), which in the present study was called "pain". The response options were yes/no.

Changes in the answers to the NMQ at the successive follow-ups were calculated by analyzing the answers of reported pain and incapacitating

Table II. *The total number of women participating at start and in all follow-ups, and the number of dropouts during the period studied*

	IT	SM	Control
Participants at start	90	93	99
Dropouts			
Known causes	32	28	25
Unknown causes	2	1	4
Refusal to take part	9	4	8
Participants at all follow-ups	47	60	62

IT: Individual Training Group, SM: Stress Management Group.

pain any time during the preceding 12 months (at the follow-ups: 6 months). Changes in pain could consequently be seen to occur in one or two steps, i.e. from incapacitating pain at start to no pain at follow-up (two steps of improvement), from incapacitating pain at start to pain at any time during the preceding 6 months (one step of improvement), or from pain at any time during the preceding 12 months at start to no pain at follow-up (one step of improvement). Aggravation of the pain was analyzed in the same way.

Perception of pain. At the follow-ups, participants were asked about their perception of the pain during the previous 6 months (5 scores).

Perceived interference with work and/or leisure activities due to discomfort in the neck/shoulders and/or back. Those who in the NMQ had indicated pain in the neck/shoulders or back were asked to rate how much these problems had interfered with work and/or leisure activities during the previous month. The rating was made on a 100 mm visual analogue scale modified from von Korff et al. (14). Endpoints were "not interfering" or "interfering very much". In the present study the differences in perceived interference were required to be more than 10 mm between follow-ups and baseline to be considered as a change.

Pain-drawing. The extension of the pain during the previous month was described on a pain-drawing. The neck-shoulder region was covered by 12, the head by 4, the upper back by 4 and the low back by 11 areas. The extension of the pain was evaluated by the sum of the areas marked (15).

Perceived physical exertion at work. Perceived physical exertion at work was measured according to Borg (16–18). The participants were asked, "How physically demanding do you in general perceive your work to be?" The answers were recorded on a scale graded from 6 to 20, where 6 means less than very, very easy and 20 means more than very, very hard.

Perceived work-related psychosocial factors. Psychosocial factors at work were assessed by a questionnaire developed by Rubenowitz (4, 19). The questionnaire comprises five psychosocial factors, namely (1) Influence on and control over work, (2) Supervisor climate, (3) Stimulation from the work itself, (4) Relations with fellow workers and (5) Psychological workload. Each psychosocial factor comprises five items and each item has five responses, where 1 means very unsatisfactory and 5 entirely satisfactory. A separate score, ranging from 1 to 5, is calculated on the mean of each factor.

Physical activities or fitness training. Questions about physical fitness were modified from Wiktorin et al. (18). The participants were asked: "To what extent have you performed physical activities or fitness training during the previous six months?" The question comprised eight answers from: "No exercise, and very little physical activity" (score = 1) to: "Some type of physical exercise—more than 3 times a week" (score = 6) and "hard physical exercise with vigorous exertion and training/competition at top level" (score = 8). Scores 6–8 were counted as score 6.

Perceived amount of training. From the 12-month follow-up onwards, participants were asked to what extent they had performed any training during the previous 6 months compared with previously (3 scores).

Questions about applied relaxation and home exercises reported at the 18-month follow-up. At the 18-month follow-up, participants were asked whether they had done applied relaxation during the preceding six months (3 scores). In the same way the participant was asked whether she had done home exercises for the neck/shoulders and back during the preceding 6 months.

Statistics

Prior to the start of the study a power analysis was done. A chi-squared test with a 5% two-sided significance level will have 90% power to detect the difference between a proportion of 0.20 (Control) and a proportion of 0.40 (intervention groups) with a sample size in each group of 118. The power was calculated on the proportion of improvement of the neck, shoulders and back pain in the intervention groups vs the control group.

The chi-squared test was used to compare proportions. The one-way ANOVA test and *t*-test were applied when groups were compared with respect to continuous variables, if they were approximately normally distributed. For other continuous and ordinal variables the non-parametric Kruskal-Wallis test followed by the Mann-Whitney test were used. The Bonferroni method was used to correct for type I errors. Correspondingly, the paired *t*-test or the Wilcoxon signed-ranks test were applied to evaluate changes within groups. $P < 0.05$ was accepted as statistically significant. All the analyses were done with SPSS 8.0 for windows (Statistical Package for the Social Sciences).

RESULTS

Participation in the intervention programmes

Besides the first examination, the IT programme included four sessions and the SM programme seven sessions and two follow-ups. Only six participants of the IT group and nine participants of the SM group attended fewer than 50% of the sessions. The results have thus been analysed independently of attendance at the sessions. Two of the 12 SM groups agreed to the participation of their immediate supervisor during the sixth and/or seventh meeting. However, one of these supervisors was not able to participate.

Comparisons between groups at baseline

There were no significant differences between the groups at baseline for any demographic or outcome variable, but for supervisor climate the SM group was more satisfied than the IT group ($p = 0.02$) and the control group ($p = 0.03$).

A. Outcome—Comparisons between groups

Musculoskeletal disorders. Results concerning musculoskeletal disorders are presented in Tables III and IV. Concerning the *neck and shoulders*, no significant differences were shown between the groups at the follow-ups.

The IT group reported less interference with work and/or leisure activities due to discomfort in the *low back* compared with the control group at the 12-month follow-up ($p = 0.02$). There was no significant difference but a tendency to a reduction in areas of the low back in the pain drawing in the SM group compared with the control group at 18 months ($p = 0.063$). A tendency to less perceived low back pain during the previous 6 months was also found in the SM group at the 12-month follow-up compared with the control group ($p = 0.057$) (Fig. 2).

Since few subjects reported pain in the *upper back* (Table I), results from this part of the body are not reported.

Perceived physical exertion at work. No significant differences between the groups were found at any follow-up (Table V)

Perceived work-related psychosocial factors. The SM group reported a significantly greater dissatisfaction with supervisor climate compared with the IT group and the control group at the

Table III. *Improvement/aggravation of neck, shoulder and back pain measured by the Nordic Musculoskeletal Questionnaire (NMQ). Changes have been calculated on reported pain any time during the previous 12 (6) months and incapacitating pain during the same period*

	Baseline—12 months			Baseline—18 months		
		n+/n++	n−/n−		n+/n++	n−/n−
Changes of neck pain						
IT group, $n = 41$		6/2	6/0		6/0	6/1
SM group, $n = 57$		17/2*	9/0		12/2	8/0
Control group	$n = 57$	16/2*	6/0	$n = 56$	15/1*	3/1
Changes of shoulder pain						
IT group, $n = 41$		11/2*	5/0		10/1	6/1
SM group	$n = 55$	16/2	9/0	$n = 56$	15/2	9/0
Control group	$n = 59$	21/1	10/2	$n = 56$	16/1	7/3
Changes of low back pain						
IT group	$n = 45$	14/0	6/1	$n = 43$	13/0	4/1
SM group, $n = 59$		15/5	5/3		16/5**	6/0
Control group	$n = 58$	12/4	7/1	$n = 57$	14/3*	7/0

n: total number of subjects.
n+/n++ (n−/n−): numbers of subjects at follow-up, reporting improvements (aggravation) in the NMQ, of one step/two steps compared with baseline. Significant differences within the groups (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$). There were no significant differences between the groups.

18-month follow-up ($p = 0.008$ and 0.006) as well as reduced stimulation from the work compared with the IT group ($p = 0.045$) (Table V).

Physical activities or fitness training. At baseline 42% of the participants reported no regular physical exercise, but sometimes, and had been physically fairly active every day, going for walks, gardening etc. Some type of exercise—approximately once a week or more was reported by 32%. The rest (26%) reported less physical activities. There were no significant differences between the groups concerning physical activities or fitness training at any of the follow-ups.

Perceived amount of training during the previous 6 months compared with earlier was significantly increased at 18 months in the SM group compared with the control group ($p = 0.04$).

Table IV. *Data for participants who indicated pain in the neck, shoulders and/or back at baseline*

	Baseline	12-month follow-up		Baseline	18-month follow-up	
	Mean/SD	Mean/SD of difference	n	Mean/SD	Mean/SD of difference	n
Interference due to neck-shoulder pain previous month (−10 > Diff >10)						
IT group	35.1/25.9	16.2/39.3	17	29.2/24.4	7.6/33.3	17
SM group	41.0/28.6	17.8/39.8*	22	38.4/27.8	13.4/37.8	16
Control group	30.0/22.8	10.1/31.6	21	35.5/24.8	6.9/42.0	26
Interference due to low back pain previous month (−10 > Diff >10)						
IT group	54.2/22.8	40.2/17.0**[a]	15	46.2/22.5	28.5/14.4**	13
SM group	50.0/32.3	43.9/34.1**	16	50.2/31.7	20.9/47.9	17
Control group	31.8/22.4	15.2/25.8*	17	35.5/19.8	10.0/32.5	17
Pain drawing, neck-shoulder previous month						
IT group	2.7/1.3	1.3/2.1*	18	2.7/1.5	0.4/1.2	19
SM group	3.0/2.6	1.1/2.9	27	3.1/2.6	0.6/3.4	28
Control group	2.8/1.6	1.2/2.0**	32	2.8/1.6	0.5/2.0	33
Pain drawing, low back previous month						
IT group	1.9/1.0	0.7/1.4	16	2.1/1.2	0.8/1.3*	16
SM group	2.8/1.8	1.4/2.1*	17	2.7/1.8	1.3/2.2*	18
Control group	2.0/0.9	0.4/1.4	28	2.0/0.9	0.1/1.5	28

[a] The IT group perceived less interference compared with the control group at the 12-month follow-up ($p = 0.02$).
Significant differences within the groups: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table V. *Perceived physical exertion at work and work-related psychosocial factors in the IT group* (n = *47), in the SM group* (n = *60), and in the control group* (n = *62)*

	Baseline	Difference between baseline and 12-month follow-up	Difference between baseline and 18-month follow-up	Difference between the groups
Total material	Mean/SD	Mean/SD of difference	Mean/SD of difference	*p*-value
Physical exertion				
IT group	14.7/1.6	1.3/2.1***	0.5/2.2	n.s.
SM group	14.0/1.4	0.6/1.9*	0.05/1.9	n.s.
Control group	14.5/1.9	0.3/2.3	0.1/1.8	n.s.
Influence on and control over work				
IT group	3.2/0.7	−0.06/0.8	−0.02/0.7	n.s.
SM group	3.3/0.5	0.02/0.6	0.13/0.5* (−)	n.s.
Control group	3.2/0.6	−0.04/0.5	−0.06/0.5	n.s.
Supervisor climate				
IT group	3.5/0.5	0.18/0.9	0.15/0.8	
SM group	3.8/0.7	0.37/0.7*** (−)	0.74/0.9*** (−)	0.006(18)[a] 0.004(18)[b]
Control group	3.5/0.7	0.28/1.0* (−)	0.20/1.0	
Stimulation from work itself				
IT group	3.6/0.6	−0.15/0.4*	−0.12/0.6	0.045(18)[c]
SM group	3.6/0.5	−0.02/0.4	0.17/0.6* (−)	
Control group	3.7/0.8	0.06/0.7	0.05/0.7	n.s.
Relation with fellow workers				
IT group	4.3/0.5	0.19/0.6* (−)	0.82/0.5*** (−)	n.s.
SM group	4.4/0.6	0.16/0.4** (−)	0.77/0.5*** (−)	n.s.
Control group	4.4/0.5	0.15/0.6	0.78/0.6*** (−)	n.s.
Physical load				
IT group	2.9/0.6	0.11/0.7	−0.03/1.1	n.s.
SM group	3.0/0.5	−0.15/1.0	0.17/0.5* (−)	n.s.
Control group	2.9/0.6	0.14/0.6	0.13/0.7	n.s.

[a] Compared with control group.
[b] Compared with IT group.
[c] Compared with SM group, (18): 18-month follow-up, (−): aggravation.
Mean and SD at baseline, and of differences between baseline and follow-ups. Significant differences within the groups (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$) and between the groups (*p*-value).

Applied relaxation and home exercises as reported at the 18-month follow-up. Though not significant, the SM group reported more frequent performance of applied relaxation and the IT group more frequent performance of home exercises compared with the other two groups (data not shown).

B. Outcome—Within-group changes

Significant within-group changes are marked by an asterisk in Tables III–V.

Musculoskeletal disorders. Perceptions of neck, shoulder and low back pain in the previous six months are illustrated in Figs. 1 and 2.

Concerning the *neck and shoulders*, improvements were shown in all groups at the 12-month follow-up, the SM group being slightly more improved than the other two groups. No general improvements were seen in any group at 18 months.

The intervention groups attained improvements of the *low back* at both the 12-month and the 18-month follow-up. In the control group significant improvements were found only for a solitary outcome variable at each follow-up (Table III and IV).

Perceived physical exertion at work. Perceived physical exertion at work was improved in the SM group, but more so in the IT group as seen at the 12-month follow-up (Table V).

Perceived work-related psychosocial factors. Generally there was an increasing dissatisfaction in all groups at the follow-ups compared with baseline, especially concerning

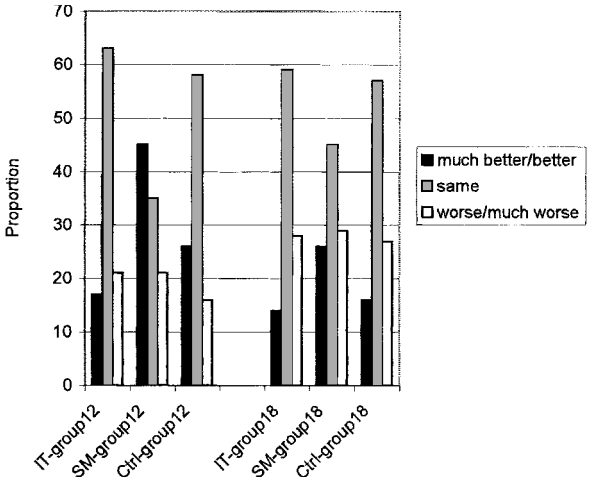

Fig. 1. Perception of neck, shoulder pain during the previous 6 months. 12, 18 = 12- and 18-month follow-ups. "Same" at the 18-month follow-up = no change since the 12-month follow-up.

relations to fellow workers. An exception was the IT group, for which an improvement in stimulation from the work itself was noted at the 12-month follow-up. At the 18-month follow-up increased dissatisfaction with all psychosocial work factors was reported in the SM group (Table V).

Physical activities or fitness training. Physical activity and fitness training increased in the SM group ($p = 0.02$) as registered at the 12-month follow-up.

In general. The positive outcome within the intervention groups generally seemed to decrease after 12 months, though compared with baseline, improvements were still seen at the 18-month follow-up.

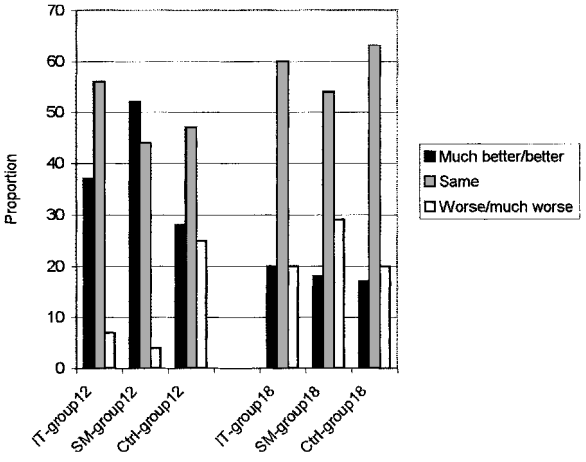

Fig. 2. Perception of low back pain during the previous six months. 12, 18 = 12- and 18-month follow-ups. "Same" at the 18-month follow-up = no change since the 12-month follow-up.

DISCUSSION

Regarding the first objective of this study, i.e. to evaluate and compare the effects of the intervention programmes on the neck, shoulder and back pain, no significant differences between the three groups could be shown unequivocally. Regarding the second objective i.e. the evaluation of intermediate indicators, the only differences between the groups were found at 18 months, with an increased dissatisfaction in the SM group concerning the supervisor climate compared with the other two groups and concerning stimulation from the work itself compared with the IT group.

Positive changes in the majority of the outcome variables, however, showed a trend of improvement in low back pain at the 12- and 18-month follow-ups within the IT and the SM groups. In the control group no trend of either improvement or aggravation was found. Improvements in neck and shoulder pain were seen within all groups at the 12-month follow-up. It may be argued that the sample size of those women indicating pain might have been too small to detect differences between groups. Furthermore, there was also a high frequency of dropouts for known reasons, mainly due to vacations or compulsory further education. This consequently lowered the power to about 0.50, which might have favoured a type II error.

Many of the participants in our study had experienced pain in the neck, shoulders and/or back, while others had not. Some participants experienced pain for the first time during the follow-up period. All participants were at work. The intervention has thus been looked upon as early prevention.

Previous studies on early prevention of back pain in nursing staff have shown improvements of intermediate indicators, mainly such as changed behaviour, but have failed to show improvements in pain (20, 21). In the study of Lagerström & Hagberg (21) an increase in low back symptoms during the study period was noted. In our study there was a reduction in one of the intermediate variables, namely, perceived physical exertion in the IT group and also improvements in low back pain in the two intervention groups.

Working in the home-care service as a nursing aide/assistant is physically and psychologically demanding. In an early prevention, disorders may not be severe, as clinically manifest disorders may take years to develop and sick leave is a late indicator of unhealthiness (22). Indicators of the outcome of early prevention thus have to be sensitive enough to catch a fluctuation of pain in any direction. It is possible that the outcome indicators in this study were too coarse to detect differences between the groups.

The perception of psychological factors at work was generally exacerbated at the follow-ups, especially concerning supervisor climate and relations with fellow workers. This was probably a result of a period of extreme turbulence in the work environment within the home-care services in the city studied, as well as in general in Sweden. However, there were improvements, especially concerning experienced low back pain, within the SM group. This could be explained by the content of the programme with an interaction not only on an inter-individual, but also an intra-individual level, as factors related and not related to work have been documented to be associated with future neck, shoulder and low back disorders in women (6, 7).

Pain history is found to be a significant predictor for neck and low back pain (2, 6, 7, 22, 23). Good coping strategies thus have to be created before or at an early stage of perceived discomfort in the musculoskeletal system. It is suggested that the possibility to, repetitively, discuss problems such as pain, alternative exercises and adherence, adapted to the participants' everyday life, strengthens self-efficacy, and is of great importance in preventing a progression of pain due to fear-avoidance of muscular activity. Thus, more sessions during the first 6-month period might have strengthened the results of the IT group, as would a prolonged intervention period for both groups, since behavioural changes take time and the positive trend in the intervention groups tended to decrease after 12 months.

That neither the IT nor the SM programme made an impact on neck, shoulder or back pain could be shown unequivocally. As the aetiology of these disorders is multifactorial, a combination of the content of the intervention programmes might thus have been preferable. This, however, demands further research.

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APPENDIX

Condensed version of the manual of exercises designed for the IT group

The physical training programme should be performed as often as possible and at least twice a week.

Posture

Correction of posture was performed in front of a mirror. The instruction given was for performance once a day. The participant was also recommended to check her posture "every time she passed a mirror or a window screen".

Balance

The subject was to stand on one leg on different underlay, 20 seconds/leg. The exercise was progressed by movements of the head, arms and/or the free leg.

Muscular endurance

The endurance exercises were repeated in three sets with a rest between lasting as long as the time required for each set.

Back muscles. The subject in the prone position with a pillow under her hips. The arms were positioned as appropriate for each individual. The back was extended a little and kept in this position for 20 seconds.

Neck flexors. The subject in the supine position with knees flexed. The chin was retracted and kept in this position for about 20 seconds. The exercise was progressed by the subject lifting her head and maintaining this position as long as possible without relaxing the retraction of her chin.

Abdominal muscles. (1) The subject in supine position, knees flexed, feet unsupported and the arms individually positioned. The trunk was curled up as many times as possible. (2) The subject sat on a stool, with her feet fixed around the legs of the stool and her back to a closed door. An elastic band, fixed to the doorknob served as resistance. The subject grasped the band with both hands at one shoulder and turned her trunk 10 times in the opposite direction. The exercise was performed 10 times towards the right and left side alternately.

Shoulder muscles, body supported on the knees and the hands. (1) Push-ups were performed 10 times. (2) While holding a weight, each arm was elevated 10 times.

Shoulder muscles, standing position. (1) The exercise was performed in front of a mirror. While holding weights, the arms were abducted ten times up to, at most 90°. (2) The subject faced a door. An elastic band was fixed to the doorknob to serve as resistance for the arm extension.

Functional excercises

Functional exercises were performed with an elastic band as resistance. The subject was to stand either facing a door or with her back to it and one foot in front of the other. The exercise was carried out by pulling the band while shifting the weight of the body from one leg to the other. The exercise was done with the left or the right foot first alternately. The quota was 10 times × 3.

Stretching exercises

Stretching exercises were performed in different positions for the pectoralis muscles, the rectus femoris muscles, the hamstring muscles and the iliopsoas muscles. The stretched position was held for 20–30 seconds.

Exercises for cardiovascular fitness

Cardiovascular fitness exercises were individually adapted after the prerequisites of each subject and performed at least twice a week. Examples of exercises were stair-climbing, brisk walking, bicycling with an extra gear, aerobics etc.