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ORIGINAL ARTICLE

Is There an Effect of an Hour Education for Decreasing the Severity of Low Back Pain and Increasing Functionality in Office Workers?

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ABSTRACT

Objectives: In this study, we gave information about appropriate working position to the office workers who have low back pain for last 3 months and we aimed to determine the effect of this intervention on frequency and level of low back pain and functionality of the workers.

Materials and Methods: This study was an interventional study. Data were collected in September 2017 and December 2017 using face to face interview method. Information was given by a one-hour conference and distributing 4 informative brochures between October 2017 and November 2017.

Results: 409 persons participated in the study and 141 of them who had low back pain for last 3 months formed the intervention group. 59.7% of the participants noted that they usually perform desk work. Logistic regression analysis showed that low back pain was 3,25 times more frequent among women than men, and 2,41 times more frequent among workers who had non-communicable disease. Among workers who had low back pain and attended the conference and read at least one brochure, mean Visual Analog Scale score was 5,97±1,2 before intervention and 5,03±1,1 after intervention ($p<0,001$) and mean Roland Morris Low Back Pain and Disability Questionnaire score were and 9,98±1,7 before intervention, and 8,91±1,3 after intervention, respectively ($p<0,001$). No difference was determined among workers who didn't attend any of these two interventions ($p>0,05$).

Conclusions: Considering the effect of intervention, this result shows that implementation of intervention with health promotion approach at workplace is an appropriate method for reducing severity of low back pain and increasing functionality.

Keywords: Low back pain, office workers, interventional study, health promotion

INTRODUCTION

Low back pain is a widespread problem, the global point prevalence is 9.4% and is considered one of the most important causes of disability [1]. 60-70% of people encounter low back pain at any time of their life [2]. It causes wage and working capacity loss, especially in developed countries. 25-50% of employees have low back pain, annually [2,3]. Low back pain / neck pain is the third most common cause of medical expenses in the United States, and these expenditures have increased by 100% between 1996 and 2013 [4].

In order to prevent musculoskeletal problems in the workforce, prevention of risk factors, correct body posture, organization of the working environment according to the worker, and ergonomics training on physical activities are required. Ergonomic arrangements in the workplace make it easier to prevent or improve musculoskeletal problems and return to work earlier [5].

Health promotion is defined as efforts to control people's health and to improve their health. Workplaces are important application areas for these interventions [6,7].

There are several studies showing that health promotion interventions about work-related musculoskeletal problems in the workplace have positive results [8,9]. In Canada, the frequency of musculoskeletal disease has fallen from 29% to 13% after ergonomics training in computer users [10]. In a study from Finland, when extensive ergonomic intervention and ergonomics training was assessed 2 months later, fewer musculoskeletal diseases were detected in the intensive ergonomic intervention and ergonomics training groups compared to the control group [11]. In an intervention study conducted by Vink and colleagues' which provided training in ergonomics to office workers, significant decrease was found ($p<0.05$) in neck, shoulder and back musculoskeletal complaints before and after training [12]. Albaladejo and colleagues conducted a study that included workers with low back pain and one group only received ergonomics training and other group combined training and physiotherapy. As a result, it was determined that the median score from Roland Morris Low Back Pain and Disability Questionnaire (RMQ) survey decreased from 7.5 to 5.5 and from 9.0 to 6.0, in two groups, respectively. In the same study, it was stated that the average scores from Visual Analog Scale (VAS) decreased from 8.0 to 6.0 in the training group and from 8.0 to 5.5 in the training and physiotherapy group [13].

Given the increased prevalence and costs associated with low back pain, inexpensive, easy-to-implement, evidence-based approaches are needed to prevent low back pain. In this study, we aimed to investigate the effect of one-hour training on decreasing the severity of low back pain and increasing the functionality of office workers

An adequate follow-up period is required to evaluate the health-related outcomes. In this study, short-term effects after a one-month follow-up period after the intervention were examined.

MATERIALS and METHODS

The study is an interventional study. The effectiveness (the severity of the low back pain and its effect on the level of functionality) of the appropriate working position information was evaluated with VAS and RMQ before and after intervention. The study was conducted between June 2017 and January 2018. In this study the descriptive phase was conducted in September 2017, the intervention phase was conducted in October and November 2017, and the post-intervention data collection phase was conducted in December 2017.

Participants and Setting

The research group was composed of 511 people working in a public institution. 477 of 511 people were reached and 409 of them agreed to participate in the study (80,0%). 141 workers who had low back pain in the last three months constituted the intervention group of the research. 6 persons could not be reached due to reasons such as job change, retirement, being on annual leave, and 135 persons accepted to respond to the second data collection form (93,7%) (Figure 1). Intervention groups were divided into 3 groups: 61 people attending a one-hour conference and reading at least one brochure, 45 people reading at least one brochure, and 29 people not attending the conference and not reading brochures (control group).

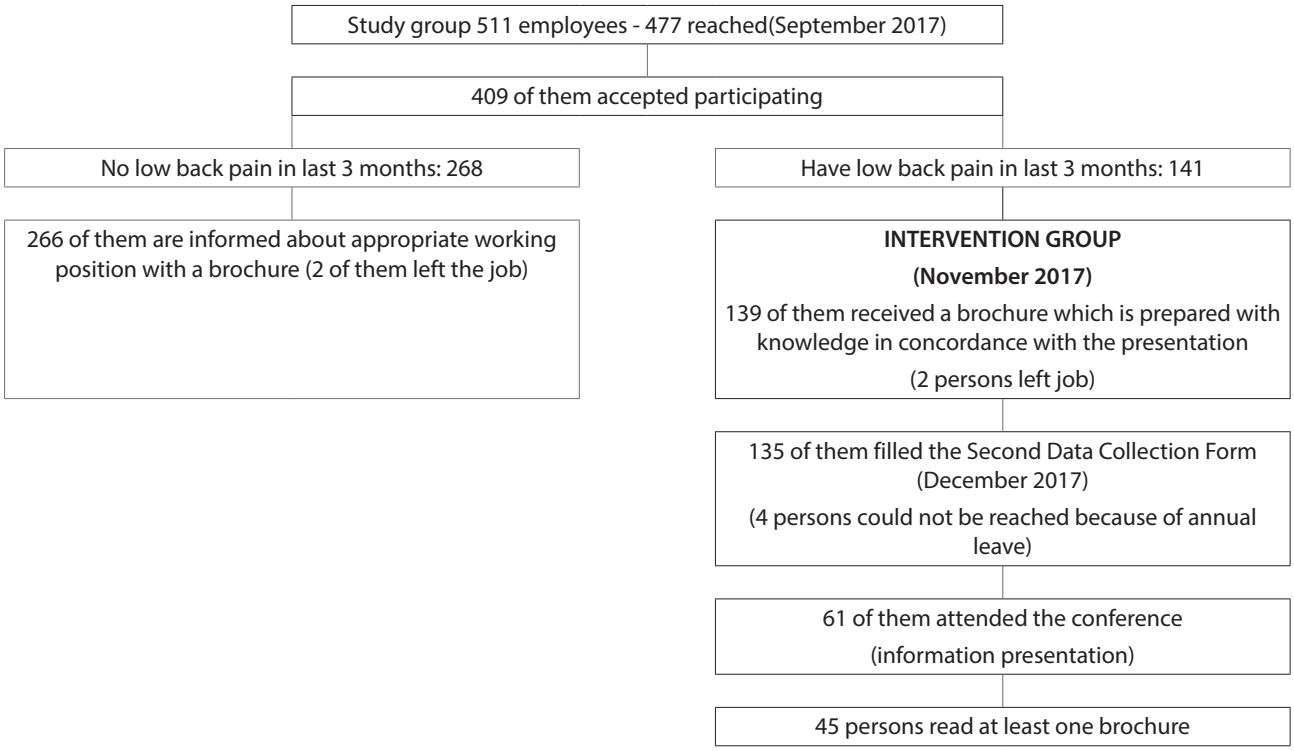

Figure 1. The flowchart of the study and the number of participants (December 2017).

Data Collection

Two different data collection forms were used, which have 67 questions in the pre-intervention phase and 60 questions in the post-intervention phase. The forms included questions about sociodemographic characteristics, information about chronic diseases, some features related to lifestyle, and some features that could affect low back pain. The VAS [14,15] and RMQ [16,17] were used in both stages in which validity and reliability were shown in Turkish language. The data were collected by the researcher using face-to-face interview method.

Dependent Variables:

• Presence of low back pain, low back pain severity, score from the Roland Morris low back pain questionnaire

Independent Variables:

• Some sociodemographic characteristics (such as age, educational status, marital status), some characteristics of working life (such as work in the institution, weekly working time), working positions, some lifestyle-related features (such as body mass index, physical activity, smoking status), having a non-communicable disease and using regular medication, some features that may affect low back pain.

Intervention

The study was conducted with workers with low back pain who agreed to participate in the study and consisted of two intervention applications: A one-hour conference on appropriate working position for participants to attend only once and 4 informative brochures with the same information and messages as the conference training, prepared with different designs. The intervention study was completed within 1 month, and one month after that the post-intervention situation determination phase was conducted.

Statistical Analysis

Data entry and evaluation of the study was done using Statistics Package for Social Sciences (SPSS 23.0). In the analyzes; descriptive statistics are given as percent, mean, standard deviation, median, quartiles, minimum-maximum values. The normal distribution of the variables was checked by Kolmogorow-Smirnow and Shapiro-Wilk tests. Chi-square tests were used to assess the difference between groups formed by categorical variables.

The effectiveness of the intervention was determined by comparison in three different groups: those who participated in the conference and read at least one brochure, those who did not attend the conference and read at least one brochure, those who did not

attend any informational intervention (conference or brochure). Differences between pre-test and post-test scores were examined by Wilcoxon test for the data without normal distribution.

In multivariate analysis, logistic regression analysis was performed using the possible factors identified in previous analyzes. Statistical significance was considered significant when the type 1 error value was below 5%.

Written permission and ethics committee approval were obtained from the General Directorate of the institution where the research was conducted. (GO 17 / 666-23, Permission dated 24.08.2017 from Hacettepe University Ethics Committee for Non-Interventional Clinical Investigations). Participants' personal and organizational knowledge was kept strictly confidential and their participation in the survey was voluntary and their informed consent was obtained.

RESULTS

Of the 409 people surveyed, 230 (56.2%) were male, about three quarters (74.3%) were married, and 56.0% were faculty-college graduates. Mean age of the subjects was 40.07 ± 9.8, median value was 40 (25%: 32 - 75%: 47, min-max: 21-63 years). 31.1% of the participants stated that they worked in this institution for 1-4 years, 19,6% for 5-9 years and 21,0% for 10-14 years. The mean duration was 10.6 ± 8.6 years and the median duration was 9 years (25%: 4 - 75%: 15). About two-thirds (68.0%) are working 40 hours a week and others 45 hours a week.

More than half of the participants (244 people, 59.7%) are usually working at the desk (39.8%, 8 hours a day, mean 6.8 ± 1.09 hours a day, median 7 hours, %25: 2 - %75: 7, min-max: 5-8 hours). 126 persons (30.8%) are generally working in standing position (47.6%, 8 hours a day, mean: 7,06 ± 1,03 hours a day, median: 7 hours, 25%: 1 - 75%: 6 hours). 39 people (9.5%) were working at the desk and in standing position at equal times. Nearly half of the respondents (47.4%) rated the working conditions as moderate, while 176 (43.1%) rated working conditions as heavy or very heavy.

345 of the participants (84.4%) stated that they did not have a chronic disease. 55 of them (13.4%) reported regular use of medication. Half of the participants (205 persons, 50.0%) were normal weight and 37.1% (152 persons) were overweight. The mean body mass index (BMI) was 25.3 ± 3.7, the median was 24.7 (25%: 22.8, 75%: 27.2 min-max: 16.8-42.2). Of the participants, 265 (64.8%) did not exercise regularly, 52 (12.7%) exercised 1-2 days per week, 50 (12.2%) exercised 3-4 days per week, and 42 (10.3%) of them exercised 5-7 days per week.

169 (41.4%) of the subjects reported sitting frequently lean forward, 75 (18.3%) extending their feet and 165 (40.3%) sitting in upright position.

Pre-Intervention Findings

Approximately half (40%) of the 409 participants stated having low back pain at any stage of their life, and about one third (34.5%) of the participants had low back pain during the last 3 months. Among the participants who stated that they had low back pain during the last three months, 86 (61.0%) of them reported that they frequently had low back pain and 77 (54.6%) of them stated that their low back pain improved during holidays. 117 of the participants (83.09%) stated that there was no disruption in daily routine work due to low back pain. Eight of the participants (5.7%) reported receiving non-physician treatment, while 40 (28.4%) of the participants said they had received a physician-recommended treatment for low back pain.

Table 1 shows some factors that may have negative effect on low back pain in last three months. Gender, age, having a child under five years old, education status, weekly working hours, presence of a non-communicable disease, regular exercise, sleeping problem, BMI, and working at appropriate position were assessed by including to the statistical model. During the last three months low back pain complaint was 3.25 times more in women than men (95% Confidence Interval (CI): 2.03-5.21, p = 0.001); 2.41 times more in participants with non-communicable diseases than those without (95% CI: 1.29-4.48, p = 0.005); 1.61 times more in participants with sleeping problems than those without (95% CI: 1.01-2.56, p = 0.044); 2.44 times more in participants who did not work in any proper position than those working in at least one proper position (95% CI: 1.12-5.31, p = 0.024). Among those who did not exercise regularly low back pain during last three months was 1.29 times more than those

Table 1. Relation between low back pain and possible risk factors (October 2017).

Demographic Properties and Risk Factors		OR	%95 Confidence Interval	p
Gender	Male **(Ref.)**	1,00		
	Female	3,25	2,03-5,21	**0,001**
Children under 5 years old	Var **(Ref.)**	1,00		
	Yok	1,29	0,73-2,29	0,379
Education status	College and above **(Ref.)**	1,00		
	High school and below	1,84	0,85-3,99	0,119
Working hours	40 hours **(Ref.)**	1,00		
	45 hours	1,02	0,31-1,64	0,464
Non-communicable disease	None **(Ref.)**	1,00		
	Present	2,41	1,29-4,48	**0,005**
Regular exercise	Present **(Ref.)**	1,00		
	None	1,29	0,79-2,11	0,295
Sleep problem	None **(Ref.)**	1,00		
	Present	1,61	1,01-2,56	**0,044**
Body mass index	Normal weight and below **(Ref.)**	1,00		
	Overweight and above	1,53	0,95-2,46	0,080
Working position	At least one appropriate position **(Ref.)**.	1,00		
	No appropriate position	2,44	1,12-5,31	**0,024**
Age		1,01	0,96-1,02	0,516
Nagelkerke r^2=0,179				

who did (%95 CI: 0,79-2,11, p=0,295) and 1.53 times more in those who are overweight than those who were not (95% CI: 0,95-2,46, p=0,080). However, these two results were not statistically significant.

Post-Intervention Findings

58.5% of the respondents reported that their low back pain was better after receiving information. 67.2% of the participants who attended the conference and read at least one brochure and 44.5% of the participants who read at least one brochure found the conference positive. The frequency of those who indicated that their low back pain improved after information are as follows according to the intervention groups; 62.3% of those who attended the conference and read at least one brochure, 44.5% of those who read at least one brochure but did not attend the conference. 46.7% of participants who read at least one brochure indicated no change in low back pain after the intervention (Table 2).

The mean VAS score of participants who participated in the conference and read at least one brochure was 5.97 ± 1.2 before the intervention, and 5.03 ± 1.1 after the intervention. The difference between the two means is statistically significant (p<0,001). The mean VAS score was 5.76 ± 1.4 before the intervention and 5.29 ± 1.2 after intervention, of participants who indicated that they read at least one brochure but did not attend the conference. The difference between the two means is statistically significant (p=0,04). Participants who were not included in any intervention group had a mean VAS score of 6.0 ± 1.3 before the intervention and 5.9 ± 1.2 after the intervention. The difference between the two means was not statistically significant (p = 0.08). The mean VAS score of all participants before the intervention was 5.84 ± 1.3 and the post-intervention score was 5.08 ± 1.6. The difference between the two scores was statistically significant (p <0.001) (Table 2).

Participants who attended the conference and read at least one brochure had an average score of 9.98 ± 1.7 from the RMQ before intervention, and 8.91 ± 1.3 after intervention. The difference between the two means was statistically significant (p<0.001). Those who indicated that they read at least one brochure but did not attend the conference had 10,08 ± 1,8 points from the RMQ before the intervention, and 9,37 ± 0,96 after the intervention. The difference between the two means was statistically significant (p= 0.007). Participants who did not participate in any intervention group had an average score of

Table 2. The distribution of pre and post-intervention average scores of participants according to the intervention groups from the VAS and the RMQ (December 2017).

VAS **Visual Analog Scale**	**Pre-intervention (Mean±SD)**	**Post-intervention (Mean±SD)**	**p value for Z statistic**
Attended conference and read at least one brochure	5,97±1,2	5,03±1,1	-3,86 <0,001
Did not attend conference but read at least one brochure	5,76±1,4	5,29±1,2	-2,03 0,04
Did not attend conference and did not read a brochure	6,00±1,3	5,90±1,2	-1,73 0,08
Total	5,84±1,3	5,08±1,6	-5,01 <0,001
RMQ **Roland Morris Low Back Pain and Disability Questionnaire**	**Pre-intervention (Mean±SD)**	**Post-intervention (Mean±SD)**	**p value for Z statistic**
Attended conference and read at least one brochure	9,98±1,7	8,91±1,3	-4,91 <0,001
Did not attend conference but read at least one brochure	10,08±1,8	9,37±0,96	-2,68 0,007
Did not attend conference and did not read a brochure	9,44±1,5	9,06±1,5	-1,22 0,22
Total	9,85±1,7	8,71±2,2	-5,89 <0,001

SD: Standard Deviation

9.44 ± 1.5 from the RMQ before the intervention, and 9.06 ± 1.5 after the intervention. The difference between the two means was not statistically significant (p=0.22). All participants had an average score of 9.85 ± 1.7 from the RMQ before the intervention, and a mean score of 8.71 ± 2.2 after the intervention. The difference between the two scores was statistically significant (p<0.001) (Table 2).

DISCUSSION

There are several interventional studies evaluating the frequency of disease development after ergonomics training in the workplace, and recent studies evaluating the effects of training on working environment and behavior. The main consequence of this study is that the intervention with training for appropriate working position reduces the severity of low back pain and the functional limitation caused by low back pain and ensures that the employees work in the appropriate position.

Pre-Intervention Data

Low back pain affects the society considerably as a result of reduced quality of life and functional losses caused by work loss and economic loss [18]. Chronic low back pain, which is a major health problem for many countries, is defined as a three-month-long sustained low back pain [19]. It has been reported that 12,5% of the total annual workday loss in the UK is due to chronic low back pain [19]. Social and psychological factors as well as factors related to working life have a great role in developing chronic low back pain. As a result of continuing low back pain, the daily functions of the patient are affected and this has negative effect on working life [20].

Of the 409 participants in the survey, 195 (47.7%) complained of low back pain at any time of their life and 141 (34.5%) of them complained of low back pain during the last three months. About two-thirds of adults in the United States experience low back pain at any stage of their lives. The direct and indirect costs associated with it exceed $ 100 billion per year [21]. In a study conducted by Cagnie and his colleagues in Belgium with computer using office workers, the frequency of musculoskeletal complaints was 45.5% [22]. In another study conducted by Eltayeb and his colleagues among 282 office workers, it was determined that the most frequent complaint was low back pain with a frequency of 64.0% [23]. Our findings are consistent

with scientific literature, however, participation in the study was based on volunteerism and complaints of low back pain were measured with subjective scales. For this reason, it should be taken into account that people who have problems with low back pain may have agreed to participate to study or have reported their complaints more exaggerated.

46.9% of the women and 24.8% of the men were found to have low back pain for the last three months and this difference was found to be statistically significant (p<0.001). In a study by Thorbjornsson and colleagues, it was found that the complaints of the musculoskeletal system were seen more frequently in women than men. This outcome was attributed to the longer improper working positions in women [24]. In our study the incidence of low back pain in female workers is similar to that of scientific literature. However, it should be kept in mind that female workers may report more symptoms of low back pain.

In our study, 38.1% of the workers who usually work in standing position have low back pain and 33.2% of those sitting at desk. The difference was not statistically significant (p=0.564). There are many studies investigating the relation of working position and low back pain. Tissot and colleagues have included 4493 workers who works in standing position and 3237 in sitting position in a large-scale study. Standing position was independently found to be a risk factor for low back pain [25]. It has been shown that the frequency of low back pain is increasing in office workers sitting at desk. The result in our research may be due to the fact that the participants who are working in standing position are generally housekeepers with a heavy workload.

Low back pain was present at 31.3% of the employees who worked 40 hours per week and 41.2% of workers who worked 45 hours per week (p=0.049). It has been shown in Yang et al.'s study that increasing working hours and workload increase the frequency of musculoskeletal complaints. When compared with those who work 40 hours a week; working between 46-59 hours per week increases musculoskeletal symptoms 1.2 times, and working over 60 hours per week increases 1.35 times [26].

We did not find a statistically significant relationship between low back pain and age. However, numerous studies have examined the effect of age on musculoskeletal diseases. Some of them report that musculoskeletal symptoms increase linearly with age [27,28] while others show that the risk of musculoskeletal disease increases up to a certain age and then decreases [29]. In another study, no significant relationship was found between age and musculoskeletal diseases [30].

In our study the frequency of low back pain was higher in employees with education level of high school and lower than the employees with college and higher education level (42.3% and 29.3%, respectively, p = 0.007). In the study of Ye and his colleagues with office workers, in China, the incidence of low back pain was found to be 66.4% in the participants with college and above education level, and 33.6% in the participants with education level under high school [31]. The result in our study is different from the study in China. But the result in Ye's study may be due to the higher health perception of participants with higher education status.

In our study, the participants who had non-communicable disease reported having low back pain more frequently than those who did not (54.7% vs 30.7%, respectively, p < 0.001). In a longitudinal, broad-based study of Esquirol et al. in France, participants with a rheumatologic disease were found to have an increased risk of developing chronic low back pain [32]. The age of the participants may have affected the result of our study.

It was found that frequency of low back pain was higher in those who stated that they had worked in a job that could lead to low back pain (than those without such work history (54.7% vs 29.1%) (p <0.001). In addition, low back pain is more common in those who indicated that they are doing an activity that could lead to low back pain in daily life than those who did not (98.9% vs. 16.6%) (p<0.001). A study by Krantz and colleagues in Sweden found that these problems were 2.09 times more likely to be encountered in situations that could cause musculoskeletal problems at work and at home [33].

Data Regarding to Interventional Study

135 persons who filled out the second data collection form (post-intervention) were asked about their opinions about intervention. 67.2%

of the participants who attended the conference and read at least one brochure and 46.6% of the participants who read at least one brochure found the intervention favorable. 58.5% of the 106 participants who participated in any intervention, stated that post-intervention low back pain was better. It is an important finding that attendees at the conference find the intervention more favorable and stated that their low back pain is better. Providing such training in the workplace is important for the improvement of employees' health.

In an interventional study, providing ergonomics training, conducted by Robertson and colleagues in university students who use computers, participants were able to identify ergonomic problems in the work environment better after the intervention [34]. Jacobs et al. found that participants gave more regular breaks and got higher scores in the post-intervention test, in their ergonomics training intervention study with university students using laptop computers, which included a control list [35]. In our study, we aimed to change the behaviors of the employees positively rather than the level of the knowledge. Finding positive feedback and other positive outcomes are important to show the effectiveness of the intervention.

A checklist on the working environment and an intervention in which a training was carried out in the study by Ketola et al with office workers. Two months after the intervention, it was determined that there was a significant decrease in the musculoskeletal symptoms of the upper body region in intervention group than the control group [11]. In a study conducted by Vink and his colleagues with office workers providing ergonomics training, it was found that the employees had a significant decrease in musculoskeletal complaints of neck, shoulder and low back 12 months after the intervention [12].

In our study, VAS score averages of participants who had low back pain, before and after intervention were 5.84 ± 1.3 and 5.08 ± 1.6, respectively ($p<0.001$). Severity of low back pain decreased significantly after intervention. The differences between pre and post intervention scores were stratified according to the three groups. According to this, it was determined that the decrease in the mean score of those who did not participate in any information application was not statistically significant while the decrease in the intervention groups was significant. Albaladejo and his colleagues conducted an interventional study in which training and physiotherapy were combined together, the median score from the RMQ was decreased from 7.5 to 5.5 in participants who received only training and decreased from 9.0 to 6.0 when training and physiotherapy were combined. In the same study, it was stated that the average VAS scores decreased from 8.0 to 6.0 in the training group and from 8.0 to 5.5 in the training and physiotherapy group.13 The addition of preventative measures such as education to therapeutic methods should be adopted as an important approach in the prevention of such diseases.

It is considered that educational intervention is effective as significant improvements observed in the severity of low back pain and functional assessment. The effect of uncontrollable variables, however, must be taken into account.

Strengths and Limitations of the Research

As an interventional study, the strength of evidence of the results make our study valuable. Participants include people engaged in a wide variety of tasks, with different intensities and difficulty. This causes the participants to move away from a single type of work. This may have been prevented the effect of the intervention to be more pronounced.

In our study, a diagnostic method for low back pain was not adopted and the evaluation was made on the complaints and pain intensity perceived by the participants, and the resultant variable for low back pain was formed in this way. This may have led to more or less reporting bias as it depends on personal perception. However, subjective complaints are valuable because it determines the use of healthcare and compliance with the working life.

We were able to investigate the short-term effects after a one-month follow-up period. It is anticipated that positive short-term effects will be detected. The inability to study the long-term effects of the intervention is a limitation of the research. There is a need for research where long term results of the intervention can be monitored.

The goal of our research is to reduce complaints of low back pain by ensuring that employees work in the appropriate working position and make ergonomic adjustments in the working environment. Studies with higher participation will help developing recommendation for solution.

A decrease in VAS and RMQ scores was also found in the participants who did not attend any educational intervention, although not statistically significant. It is believed that the participants in this group were informed without a certain level of knowledge, and this was due to the fact that they worked with those in some intervention group or those who were asked questions during the collection of information which had an "undesirable education effect".

In this study there was no intervention for treatment. Those who reported severe low back pain complaints were advised for an occupational physician visit.

When the findings are evaluated together, it is determined that intervention consisted of appropriate working position information is effective on the result variables observed in employees. This result suggests that an intervention with a health promotion approach at the workplace is a convenient way to reduce the complaints of low back pain and increase the functionality of the employees.

The intervention of appropriate working position training was proposed according to the working environment where the employees can make changes individually and the personal protective behavior. However, preventive measures should also be taken for areas with ergonomic challenges where employees cannot make a change.

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