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Comparing the Effectiveness of the Two Different Education Methods on Musculoskeletal Pain and Functional Disability among Teachers living in Savojbolagh City, Iran

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Background: Low Back Pain (LBP) is one of the most common Musculoskeletal Disorders (MSDs). Teachers are among those who are at risk for the MSDs due to their occupation. Education. The aim of this study was to compare the effectiveness of two education methods in reducing pain and functional disability in two groups of teachers.

Methods and Materials: In this experimental study two questionnaires of VAS, to measure the pain severity, and the Oswestry Disability (ODI) questionnaire for measuring functional disability were distributed among the 175 teachers with LBP as pre-test. Participants were randomly divided into three groups: one control group with 35 participants and two experimental groups with 70 participants. One of the experimental groups received education by face-to-face lecturing and the other one with a tutorial CD. Eventually, 6 weeks after the intervention, post-test was conducted.

Results: The mean value for of pain and functional disability was not significantly reduced in the control group. But in both intervention groups, there was a significant decrease in pain and functional disability. The pain intensity in face-to-face education group decreased from 5.13 ± 1.54 to 3.79 ± 1.76 and in CD education group from 5.11 ± 1.57 to 2.63 ± 1.56, indicating that the most pain reduction was in the CD e education group. The mean of functional disability was reduced in face-to-face education groups (from 29.60 ± 10.97 to 20.74 ± 10.16 and in CD education group from 33.06 ± 13.04 to 19.43 ± 12.47.

Conclusion: CD education method was more effective than face to face education in reducing back pain. Education. Therefore, considering the low cost but high effectiveness of CD education methods, it is recommended that this method be used more for teachers' education.

Keywords: Low Back Pain, Functional Disability, Education, Teacher

Introduction

One of the current chronic diseases which many are suffering from is Musculoskeletal Disorders (MSDs) caused by work. MSDs are among the common causes of occupational injury and disability in industrialized and developing countries (David, 2005). Skeletal disorders are defined as conditions in which muscles, tendons, and nerves are damaged. Their symptoms begin with fatigue, pain, discomfort, and numbness and lead to a disease in which limb movement is limited, or muscle strength is reduced (Asghari, Omidiyani, & Farvaresh, 2012; Centers for Disease Control and Prevention, 2013). MSDs account for nearly half of all the diseases caused by work and are the main cause of decrease in working hours and increase in

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cost and work-related injuries (Kemmlert, 1995). One of the main reasons for Absence from work is musculoskeletal injuries and also according to the reports, about 44% of the work-related compensation costs are related to MSDs (Palmer et al., 2012). In UK, in 2013-2014, from 1241,000 MSDs cases, 526,000 cases were associated with occupational diseases, which resulted in 15.9 days sick leave for each person (Health and Safety Executive, 2014). In many studies, factors such as intense physical activity, high physical activity, repetitive movements, inappropriate physical condition or performance, high speed at work, lack of rest between work stages, work shift, individual factors (age, gender, height), high BMI) Body Mass Index), inadequate work experience and education are known as the prevalent MSDs influencing factors (Volkers, Westert, & Schellevis, 2007).

The need to improve the work condition has been proven in a large number of studies, indicating that there is a direct relationship between undesirable postures and functional abnormalities or pain in various parts of the musculoskeletal system (AARÅs & Stranden, 1988; Zakeriyan et al., 2012; Dehghan, Choobineh, & Hasanzadeh, 2013).

Studies show that back pain is one of the most commonly diagnosed diseases of the skeletal system so that 58-84% of the people in the community experience it once in their lifetime, and in 50% of the adults, LBP occurs in career ages (Rubin, 2007; Nuri et al., 2011). LBP is the first cause of disability in people under 45 years old, the second cause of referring to the doctor, and the third cause of surgeries (Nuri et al., 2011). According to the reports, LBP is more common in young women (Andersen, Wedderkopp, Leboeuf-Yde, 2006). In developed countries, the overall cost spent on back pain is annually about 1.7% of all national gross products (Nuri et al., 2011). In people under 45 years old, LBP is the most important limiting factor for personal and social activities wasting 23 working days of a year for each person (Salvati, 2002). Also, LBP is the main cause of disability and absence from work) (Maetzel & Li, 2002).

In Iran, limited epidemiological studies have been conducted on the prevalence rate of LBP. In one of the comprehensive studies conducted in 2012 a large sample of 25307 people with the age ranges from 65-20 years was included. In this study, the prevalence rate of LBP in the studied population was reported as 29.3% (Tavafian, Gregory, & Montazeri, 2008). In another study conducted on musculoskeletal problems in rural areas of Iran, the prevalence rate of LBP was reported as 23.4% (Davatchi et al., 2009).

Teachers are among the working groups who are at high risk for MSDs due to the type of their occupation, and many of them of them suffering from the pain caused by these disorders. Most teachers' tasks are in standing conditions with "head down" mode or in sitting conditions during repeated readings, correcting assignments, or writing on the blackboard, which may affect their physical and mental health (Erick & Smith, 2011). Several studies have reported the prevalence rate of MSDs among the teachers in different countries from 39 to 95% (Erick & Smith, 2011; Korkmaz, Cavlak, & Telci, 2011; Chong & Chan, 2010; Fjellman-Wiklund & Sundelin, 1998).

In people with chronic LBP, changes in deep muscle stabilization activity due to pain or injury lead to disrupted posture control and reduced body control. Hence, corrective movements and appropriate exercises are one of the common and good treatments for reducing back pain. The main goal of these exercises is to gain the strength, tolerance, and flexibility of the spine in order to improve injuries (Kofotolis & Kellis, 2006). Ergonomic education is the oldest and, most commonly used approach to prevent back pain (Zakeriyan, 2007). After ergonomic education, exercise therapy is one of the most effective treatments for back pain that patients can do alone, or along with other treatments (Airaksinen et al., 2006; Hayden, Van Tulder, & Tomlinson, 2005). Although the effect of educational on the reduction of pain caused by skeletal disorders has been proven (Moon et al., 2013; Rhee, Kim, & Sung, 2012; Babaei, 2013; Kamali Sarvestani, Derakhshan Rad, & Hamooleh, 2012), not all education methods are equally effective or cost effective. Therefore, considering the high prevalence rate of LBP among teachers and the effectiveness of education in reducing pain, identifying more effective education methods is necessary.

Choosing an appropriate education method is one of the most important steps in the course of designing an education program because an

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effective learning is mostly the result of a good education method. Considering the busy schedule of teachers' work, budget limitations and the existence of an electronic educational structure in Ministry of Education system, and should be evidence- based and cost effective. Therefore, this study was conducted with the aim of designing, implementing, evaluating, and comparing the effectiveness of two face to face and CD education methods in reducing the teachers' pain and functional disability caused by MSDs in Savojbolagh city, Iran.

Methods and Materials

This study was designed as an experimental study. In this study, from 235 volunteer teachers with LBP, 175 cases having the criteria for entering the study were included. The inclusion criteria were as follows: having at least two years of work experience, confirmation of musculoskeletal pain after examination by a chiropractic specialist, having chronic pain (history of pain greater than 12 weeks), and a maximum score of 7 for pain. Exclusion criteria were as follows: having a history of specific systemic disease, surgery, spinal cord injury, and structural disorder in the spine and organs. The subjects were randomly assigned into three groups using Random Allocation software (RAS) version 9. The first group with 70 students received education during a face-to-face education session (3 hours) by lecture and practical presentation. The second group with 70 students received education by a CD in accordance with what was taught to the lecture group. In other words, the content of the education was similar in two experimental groups. The control group with 35 students did not receive any education. The instructor in both experimental groups (face-to-face education and education through a CD-ROM) was a chiropractic doctor who had examined study participants.

To measure the amount of back pain in patients (during the past one to two weeks), the VAS measurement scale which is a 10 cm bar was used. Zero score is referring to painless), and 10 is accounted for most possible severe pain. VAS is the most reliable pain grading system for comparing different periods, which has been widely used in research (Price et al., 1983; Cairns, Foster, & Wright, 2006). Its reliability and validity is excellent, and its internal reliability is acceptable (ICC[1] = 0.9) (Boonstra et al., 2008; Rezvani et al., 2012). The Oswestry Disability (ODI) questionnaire was used to measure disability levels (during the past one to two weeks) (Nuri et al., 2011; Kamali Sarvestani, Derakhshan Rad, & Hamooleh, 2012). This questionnaire shows the percentage of functional disability of people with LBP. The lower the disability indicator, the more a person is healthy and can perform daily activities with less pain and vice versa.

Mousavi and his colleagues developed the Persian version of the questionnaire and reported its reliability and validity in the Iranian community (ICC = 0.91, α = 0.75). This questionnaire provides good information about the various aspects of a patient's disability (Mousavi et al., 2006).

Results

Demographic characteristics of the participants in this study are presented in Table 1, separated according to the experimental and control groups. As shown in Table 1, although the majority of participants were female, there was no significant difference between women and men in the three groups. There was also no significant difference in mean age between the groups; however, the highest and lowest work experience was observed in the CD education group and control groups, respectively which were statistically significant. Differences were also significant in terms of average working hours per week; the highest working hours were reported to be in a CD education group, followed by face to face education group, and finally, the lowest working hours were reported the control group control group. It should be noted that the hours worked by the CD education group were significantly higher than the control group; however, there was no significant difference in working hours between the face to face educations.

1. Intra class correlation coefficient**.**
2. Oswestry Disability Index**.**

Group and none of the other two groups.

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Table 1. Demographic information.

Variables	Control group	Face to Face education group	CD education group	P value
Age	39.8 ± 5.4	40.5 ± 6.9	40.8 ± 6.1	.561 .579
Work e experience	16.5 ± 7.4	16.9 ± 7.3	19.0 ± 7.7	.025 3.74
Working hours/week	27.7 ± 7.28	25.8 ± 5.25	29.3 ± 8.59	.001 *F* = 8.53

According to the Table 2, there was no significant difference in terms of mean of pain before the intervention between the control group and face to face and education groups. However, the mean score of pain after the intervention was significantly different between the control group and face to face and CD education groups. Using Tukey test to compare the groups in pairwise mode, it was shown that there is a significant difference between the three groups. Using the Dunnett test, it was found that there is a significant difference in the amount of pain between the face to face and CD education groups so that the highest pain intensity was observed in the control group, and the least was observed in the CD education group.

Table 2. The degree of pain and functional disability in the studied groups before and after the intervention.

Groups	Number	Pain Mean ± SD		Results	Functional disability Mean ± SD		Results
		Before intervention	After intervention		Before intervention	After intervention	
Control	35	5.11 ± 1.43	5.06 ± 1.39	t = 1.435 p = .160	30.34 ± 14.0	30.06 ± 13.6	t = 1.435 p = .32
Face to face Education	70	5.13 ± 1.54	3.79 ± 1.76	t = 9.438 p = .001	29.60 ± 10.97	20.74 ± 10.16	t = 6.96 p = .001
CD Education	70	5.11 ± 1.57	2.63 ± 1.56	t = 15.546 p = .001	33.06 ± 13.04	19.43 ± 12.47	t = 10.846 p = .001

The mean score of functional disability before the intervention between the control group and face to face and CD education groups was not statistically significant. However, the mean score of functional disability after the intervention was significantly different among the groups. Using the Tukey test, it was found that there is no significant difference between the face to face and CD education groups after the intervention in terms of functional disability, but both groups had a significant difference with the control group. Using Dunnett test, it was also found that there is no significant difference between the two face to face and CD education groups (p =.0746); in other words, the most severe disability was related to the control group. The degree of disability in face to face and CD education groups was close to each other, but in both of these groups, the disability was less than the control group.

As shown in Table 3, considering the role of probable confounding variables such as the severity of pain and disability before the intervention, age, sex, work experience, working hours, education level, marital status, and the severity of pain and disability after the intervention, it can be stated that there is a significant relationship between pain and functional disability before and after the intervention; however, this relationship is not significant in other variables (age, sex, work history, hours of work, education level and marital status).

Table 3. Regression analysis of research variables (dependent variable of pain and disability after intervention).

Dependent Variables	Pain *p*	Functional Disability *p*
Constant Number	.135	.751
pain before intervention	.001	.001
Age	.72	.679
Sex	.134	.149
Work Experience	.652	.609
Working Hours	.110	.10
Education	.352	.173
Marital Status	.927	.266
Study Groups Intervention	.001	.001

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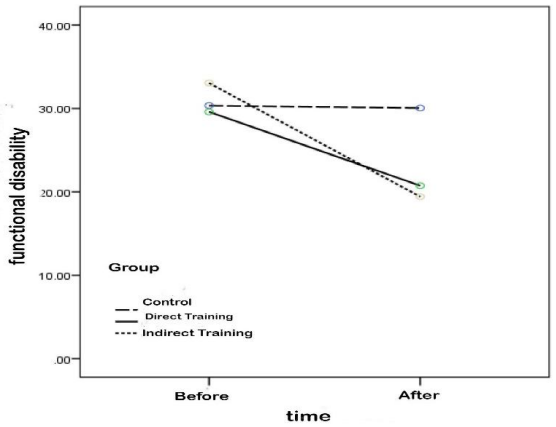

Figure 1. Functional disability changes in different groups

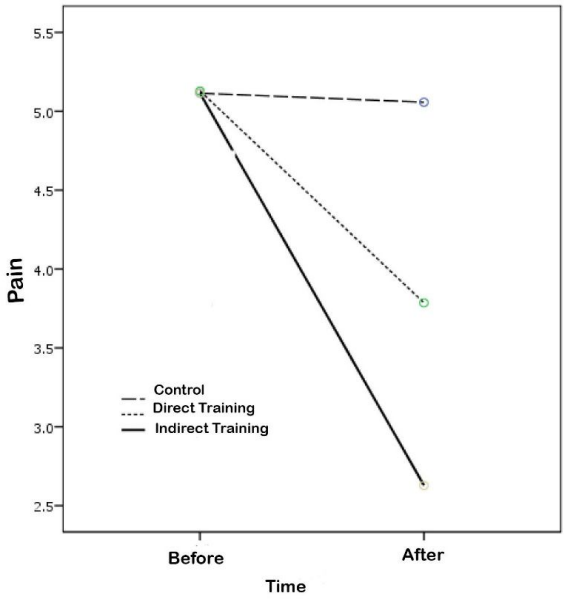

Figure. 2 Pain variations in different groups.

Discussion

Certainly, teachers' LBP reduces their functional ability and has negative impact on their professional performance, and consequently, on the process of student's learning. This study showed that proper education had a positive effect on LBP so that even holding one education class reduced the back pain and functional disability among teachers by 26 and 30%, respectively. On the other hand, the distribution of an educational CD was able to further reduce the teachers' pain (42%) and functional disability (50%), especially in those who had more working hours. Given that even only one good education session and an effective worthwhile film which was able to significantly reduce teacher's pain and functional disability which does not impose much cost of the educational system the importance and urgency of providing ergonomic education for teachers with back pain, and even those with no back pain can be highlighted more.

The exercises used in this study for patients' treatment were very simple exercises that did not require special equipment and so can be done in any place and conditions. Various studies have confirmed the effectiveness of educational interventions and ergonomics in reducing pain and functional disabilities caused MSDs (Kamali Sarvestani, Derakhshan Rad, & Hamooleh, 2012; Owen, Keene, & Olson, 2002; Robertson et al., 2008; Kee & Seo, 2007). Another study showed that, 5 years after applying ergonomic program, not only the amount of back and shoulder injuries, but also lost working days and limited working days significantly reduced (Owen, Keene, & Olson, 2002).

It should be noted that the education methods and the quantity of pain reduction were different in different studies. For example, in a study in Iran using the educational pamphlets, the mean of pain severity in the staff based on VAS scores changed significantly from 4.67 in the pre-intervention period to 2.62 in the post-intervention period; also, the average disability score changed significantly from 23% to 17%(Kamali Sarvestani, Derakhshan Rad, & Hamooleh, 2012). In another study, the control group received only ergonomic education, and the experimental group received a combination of therapeutic exercises and ergonomic education through virtual space. LBP in the experimental group with lumbar abnormality, which was educated in virtual space compared to the control group, changed from 42.7 to 8% (Babaei et al., 2013). In the study by Rhee and colleagues in 2012, the results showed that in two experimental groups, the amount of pain and the degree of disability decreased significantly. Also, the results of Rhee studies on the effect of confounding factors (age, gender, and weight) are consistent with the results of this study (Rhee, Kim, & Sung, 2012).

Some existing studies suggest a positive impact of electronic ergonomics education on improving individuals' awareness, attitude, and practice (Jacob & Taveira, 2011) and also on reducing pain (Babaei et al., 2013; Jamshidi, Abbaszadeh, & Najafi-Kalyani, 2011). In one study, the control group received routine oral education by nurses in the angiographies section, and the experimental group was presented an educational film

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containing the before, during, and after angiography necessary measures. After angiography, the patients' degree of fatigue and pain were measured using the VAS. The results of this study showed that education through the film caused a significant reduction in patients' LBP after the angiography (Jamshidi, Abbaszadeh, & Najafi-Kalyani, 2011), which is in line with the results obtained in our studies.

It seems that greater impact of the use of film method compared to face to face method is mainly due to the ability to repeat the educations in different situations while learning through face to face methods can quickly be forgotten if not be practiced. The repeated use of educational content minimizes the possibility of forgetting presented in face to face education over time. In addition, the nature of this method is probably more attractive to draws attention better. It can also be argued that education through compact disc provides opportunities and benefits with more flexibility for learners in the learning process which is not limited in time and space (Padalino & Peres, 2007). On the other hand, education by CD method may be much cheaper than face-to-face education. Overall, both methods have been effective in reducing pain, which to some degree can indicate the good quality of education design, especially in developing skills.

Considering the prevalence of LBP and functional disability among the professionals such as teachers and the existence of scientific evidence about the effectiveness of education in reducing these problems, it is recommended to place pain relief education programs as part of teachers' in-service education On the other hand, due to the compactness of the teachers' curriculum and the difficulty in coordinating common free time among teachers to attend to face to face education classes as well as the cost of holding education classes, the use of effective CD methods should be given more attention by education officials. Therapeutic exercises in this form can be recommended as an independent treatment method for treatment of patients with LBP. Doing this form of exercise, in addition to accelerating the pain reduction, improves mental condition and ultimately reduces the rate of disability caused by the back pain. Hence, it seems that ergonomic education for all teachers should be part of their educational and health services. Due to the existence of in-service programs as well as electronic educational structures, it is recommended that all health-related educational materials which have scientific quality and credibility, be electronically available to all teachers throughout the country.

Conclusion

CD education method was more effective than face to face education in reducing back pain. Therefore, considering the cost and effectiveness of CD education methods, it is recommended that this method be used more for teachers' education.

Conflict of Interest

There is no conflict of interest for this article.

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Author contribution

EN: She conducted the study and drafted the first version of the paper.

NKM: She was responsible for designing the study, supervising the implementation and finalizing the paper.

SS: She contributed in study design and was responsible for data analysis.

MS: She contributed in designing the study and was responsible for utilization of the questionnaires.

MK: He contributed in recruiting the participants, and also he delivered the education.

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