ORIGINAL RESEARCH

The impact of modified exercise and relaxation therapy on chronic lower back pain in office workers: A randomized clinical trial

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Running head: modified package of exercise therapy for chronic low back pain

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Abstract

Objective: To evaluate the effectiveness of a modified package of exercise therapy combined with relaxation on pain intensity, range of motion (ROM), anxiety, and quality of life (QoL) in office workers with chronic lower back pain.

Methods: In this clinical trial, office workers with chronic low back pain were randomized to one of four groups including; Group 1- Exercise therapy; Group 2- Psychotherapy (relaxation therapy); Group 3- Combined protocol (exercise followed by relaxation therapy); Group 4- control (no intervention). Exercise time was three sessions per week for 6 weeks with each session consisting of a 40-45 min bout of exercise/relaxation. Outcome measures included changes in pain intensity, ROM, anxiety, and QoL were studied at baseline, 6 weeks, and 12 weeks at the end of the intervention. Results: In 72 staff (20-50 years old) a significant decrease in pain intensity and anxiety was evident in the three experimental groups compared to the control group. The three intervention groups indicated a significant decrease in pain intensity and anxiety after 6 and 12 weeks. ROM significantly improved in the exercise therapy group and the modified protocol group over time (after 6 and 12 weeks). A significant difference between groups was observed in quality of life with greater improvement in the psychotherapy and modified protocol groups.

Conclusion: This therapeutic package (including exercise and relaxation) showed a superior effect for all variables compared to other interventions with increased range of motion, quality of life, and reduction in pain and anxiety after 6 and 12 weeks. Thus, the combined protocol (exercise and relaxation) can be used as an efficient package for decreasing physical and psychological factors in people with chronic lower back pain.

Keywords: Exercise therapy, Psychological, Low back pain, Office workers

Introduction

Lower back pain (LBP) is a common condition which has considerable impact on 85-90% of people in both developed and developing countries [1–3]. Most people have experienced LBP at least once in their lives, especially the non-specified type defined as any low back pain in the lumbar area, which is not related to a severe pathology and is caused by unknown reasons [4,5]. If individuals do not take their LBP seriously, the pain may continue, intensify, and may ultimately lead to disability [6]. The high prevalence of lumbar-related injuries can have a high impact at the individual level but also a significant impact on healthcare services locally, regionally and nationally [7,8].

Due to prolonged sitting and inactivity in office workers, LBP is a common reason of disability in this group [9]. The economic burden of LBP is very high. In addition, the indirect costs of LBP due to lost productivity and early retirement continues to increase [10]. Therefore, in order to develop effective rehabilitation strategies for work-related LBP, understanding and identifying the factors that increase the risk of low back pain are necessary [11]. Based on growing body of literature, LBP is a multifactorial disorder with many risk factors including physical and psychological. Physical factors include stature, body mass, age and body mass index (BMI). Psychological factors include mental fatigue, anxiety, and depression [12,13]. Stressful factors can cause the lower back muscles to spasm, and increase the incidence of LBP. For example, LBP is not only associated with heavy work, but also the mental stresses of the workplace, plus prolonged periods of sitting is a strongly associated with LBP [13–15]. Hence, for the management of LBP a multifactorial approach including physical and psychological wellbeing maybe required. Recently, new treatment methods based on physical exercise have been proposed, but these methods generally focus on the full length of the spine [16,17]. Often the impact of psychological wellbeing

is not included in interventions. Therefore, the aim of the current study is to modify a new therapeutic exercise protocol presented by Shariat et al in 2017 [17] with the purpose of representing an intervention that addresses both physical and psychological wellbeing.

Methods

The present study was a single blind randomized control trial with parallel groups. In this study, office workers with chronic LBP were selected. The study was open to residents of the city of Tehran from 2018-2019. Following ethical approval, participants provided full written consent prior to recruitment. The inclusion criteria for enrollment was class 11, 1 ASA age 20-50, chronic LBP for >3 months with at least two symptoms of chronic LBP including pain reported when lifting heavy loads or feeling pain during changing postural position, absence of pain in lower limb during physical testing, absence of disc tearing, presence of low intensity pain signals between vertebral area, and absence of joint burst following MRI. Participants were excluded if they used corticosteroids or had symptoms (dizziness or unconscious feeling, paralysis) prior to the start of the study. Each participant was evaluated by a qualified physician and underwent a MRI scan to determine the extent of damage in the lower back region.

Based on the randomized block design, participants were randomly recruited into one of four parallel study arms; Group 1- Exercise therapy (including Williams and McKenzie exercises); Group 2- psychotherapy (based on breathing instructions); Group 3- modified protocol (Williams and McKenzie exercises followed by relaxation therapy); 4- Control (no intervention). Physical exercises and relaxation techniques were shown to clinical staff via an instructional video.

Participants were required to undertake three non-consecutive sessions per week for 6 weeks, with 40-45 min for each training session.

The physical exercise component included 13 simple exercise movements, derived from William's exercises and followed the recommendations of the American College of Sports Medicine. This protocol was previously introduced by Shariat et al as an effective protocol for LBP [10,18]. Each movement was repeated on three occasions. All exercise are slow and controlled movements which should be performed three times a day with 10 repetitions. Pain reduction, increase flexibility and easy to perform in office environment are some advantageous for this method. For example, GIVE AN IDEA OF SOME OF THESE EXERCISES. The relaxation component was based on the stress management model, and followed guidance provided by Conrad et al. [19]. To perform this test participants were instructed to be relax for 8 min while they sat on a comfortable chair in a large room with appropriate light and temperature without any noise. At that time, they were asked to perform the breathing instruction for four minutes as a follow: breathe at their usual depth and rate and during inhaling counting from the breath silently 1 to 10 and backward from 10 to 1and think the word “relax” during exhaling. During the test their eyes were open and they were asked to breathe through their nose.

This component consisted of a 20-25 min group session led by a sports psychologist and followed the physical exercise component [19]. They could communicate with the participants using intercom.

Outcome Measurements

The outcome measurements include the evaluation of quality of life using the QoLs questionnaire [20], anxiety and depression using the hospital anxiety and depression (HADS) questionnaire [21], the severity of pain based on the FRI test [22], waist-to-hip ratio was also measured before the treatment, 6 weeks (after the end of the intervention), and 12 weeks following the intervention. Cronbach's alpha of the Iranian HADS questionnaire was obtained between 0.78 and 0.86 for anxiety and depression (6), respectively.

Sample size

The sample size was calculated separately for each dependent variable, and the highest number was considered as the sample size for our study. The sample size for each group was 28 participants with an additional 20% added due to likely attrition over the 6-week intervention; therefore we estimated that 34 individuals would be required for each group.

Data Analysis

To evaluate the normality of the data the Kolmogorove-Smirnov test was performed. The distribution all of variables was normal. After evaluating the normality of data; ranges, means, and standard deviations were reported and baseline characteristics between groups were assessed by the independent t-test. For each variable the main and interactive effects of group (exercise therapy, psychotherapy and modified protocol) and time were determined using a mixed model of analysis of variance (ANOVA). Data analysis was conducted using SPSS Inc., Version 22 (Chicago, IL, USA).

Results

Of 89 participants with chronic LBP who volunteered for the study, 76 person (range: 20-50 years) were eligible to participate. Of the initial 76 participants, 72 (95%) completed the study (Fig 1). However, the data from four participants who were not completed the follow up due to disease excluded from the analysis (Fig. 1).

Prior to the start of the experiment, our findings showed that there were not significant differences on baseline characteristics between the four groups. Our findings indicated that a significant improvement in ROM in the exercise therapy and its combination with psychotherapy compared to control and the psychological interventions group. The results showed that there was a significant Group-by-time interaction effect and a main effect for time ($P<0.001$). Bonferroni corrected test revealed that a significant improvement of ROM in the exercise and the modified protocol after 6 and 12 weeks, but there was no significant effect between 6 and 12 weeks.

The mean score of MSD in the lower part of the body in all intervention groups (therapeutic exercise, psychotherapy, and their combination) significantly decreased. This change was lower than 1 for the control, implying that MSD scores were affected by psychotherapy and exercise therapy and their combination. The time effect, also, was significant in the all intervention groups and post hoc analysis exhibited that pain reduced after 6 and 12 weeks intervention ($P<0.001$). No significant differences was found between 6 and 12 weeks.

The quality of life significantly increased after intervention in the psychotherapy and modified protocol groups compared with exercise and control groups. Also, Group-by-time interaction effect and a main effect for time was revealed that by increase in the quality of life after 6 and 12

weeks in the psychotherapy and modified protocol groups (P<0.001). There was no significant differences between 6 and 12 weeks.

Anxiety decreased significantly in three intervention groups compared to control group. Also, there was a main effect of time on this change. Post hoc tests showed that decrease anxiety between 6^{th} and 12^{th} weeks did not significantly differ (P=0.1), but it significantly decreased after 6 and 12 weeks compared to the baseline in all intervention groups (P<0.001).

Discussion

This study aims to determine the effectiveness of modified protocol of exercise therapy with a relaxation component for employees suffering from chronic low back pain. Several interventions and one control group (no treatment) were used in order to increase the reliability of the measurement.

Our results indicated that using the modified protocol and also exercise therapy lead to increase ROM in participants. In addition, it was discovered that the effectiveness of these therapies have lasted for 3 months after the therapy sessions have ended. The results of this study are in line with those of Gordon et al [23], Freimannet al [24] and Kim et al [25] which showed multidimensional interventions are more effective in the treatment of chronic low back pain. Even though the type of interventions is different. The psychological interventions which focus on both the physical and mental pains can also have positive effects, but previous published studies are limited in this field [26–28].

Another main variable is the scores of Cornell questionnaire based on the pain intensity, as the MSD index. The results showed that exercise therapy, psychotherapy, and the combination of both treatments have significantly decreased the pain intensity in the three experimental groups

compared to the control group. This indicates the effect of these interventions on the pain intensity of the office workers. In the study of Hayden et al., the progressive resistance exercises, which strengthen the abdominal and spinal muscles are effective in decay pain in people with the low back pain [29]. Also, this finding is consistent with that of Good who reported that psychotherapy (relaxation techniques)is effective in the treatment of the employees with chronic low back pain [30]. Even so, the research population of Good's study is different from that of the current study. These results are somewhat justifiable, because to some extent, psychological problems such as stress, anxiety, depression, anger, and rage can intensify the backache and make it chronic. Therefore, relaxation exercises can solve these problems.

Another study showed that the three methods of exercise therapy (William's exercises, McKenzie's exercises, and stabilizer exercises) are effective in reducing the pain intensity and disability rate of chronic low back pain patients. However, the time and speed of pain reduction, disability rate, and the persistence of pain-killing effects in the group that did the stabilizer exercises were significantly different from those of two other groups [31]. In comparison with the current research, similar results in the treatment of chronic low back pain have been observed in the part which William's exercises are performed.

The data achieved from this study shows that the mean quality of life score has increased in the psychotherapy and modified protocol groups These groups had achieved a better quality of life in comparison to the exercise and control groups. The results of this study are in line with those Tavafian. They concluded that the educational program (back school) promotes the quality of life of women suffering from a low back pain [32]. Although this study is different from the current study in terms of intervention type and research population, the results indicate that the quality of

life of persons suffering chronic low back pain is affected mostly by their mental issues, rather than the physical problems [33].

Another main variable is the scores of the HADS questionnaire as the anxiety index. The results indicate that the mean score of HADS had decreased in all the groups (exercise therapy, psychotherapy, and the combination of both) after the interventions. Meanwhile, this change was subtler in the control group. In line with the present study, Diepenmaat et al. showed that musculoskeletal pain is associated with depression and stress [34]. Even so, it is necessary to do more researches regarding the long-term effects of this treatment method, with a larger sample.

In conclusion, our therapeutic package (including exercise and relaxation) showed a superior effect for all variables compared to other interventions with increased range of motion, quality of life, and reduction in pain and anxiety after 6 and 12 weeks. Thus, the combined protocol (exercise and relaxation) can be used as an efficient package for decreasing physical and psychological factors in people with chronic lower back pain.

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Table 1 Study arm data for range of motion (ROM), pain, quality of life, and anxiety at each time point (N=72). Data presented as mean ± SD.

	Exercise therapy (N=19)	Relaxation (N= 17)	Combined (N=19)	Control (N=17)
ROM				
Baseline	70±10	68±9	71±10	72±7
6 weeks	73±9	71±12	74±11	73±8
12 weeks	76±11	73±10	79±10	73±7
P value	0.04	0.05	0.01	0.12
Pain				
Baseline	13±2	12±2	14±1	12±2
6 weeks	4±1	5±1	4±1	11±2
12 weeks	3±2	3±1	2±1	11±1
P value	0.02	0.03	0.02	0.13
Quality of life				
Baseline	42±6	46±4	44±5	19±7
6 weeks	64±4	62±7	64±6	17±3
12 weeks	68±5	66±8	66±4	18±4
P value	0.06	0.04	0.01	0.17
Anxiety				
Baseline	14±2	15±2	14±3	13±2
6 weeks	12±3	11±2	10±4	11±2
12 weeks	8±1	7±2	6±3	12±2
P value	0.01	0.04	0.01	0.17

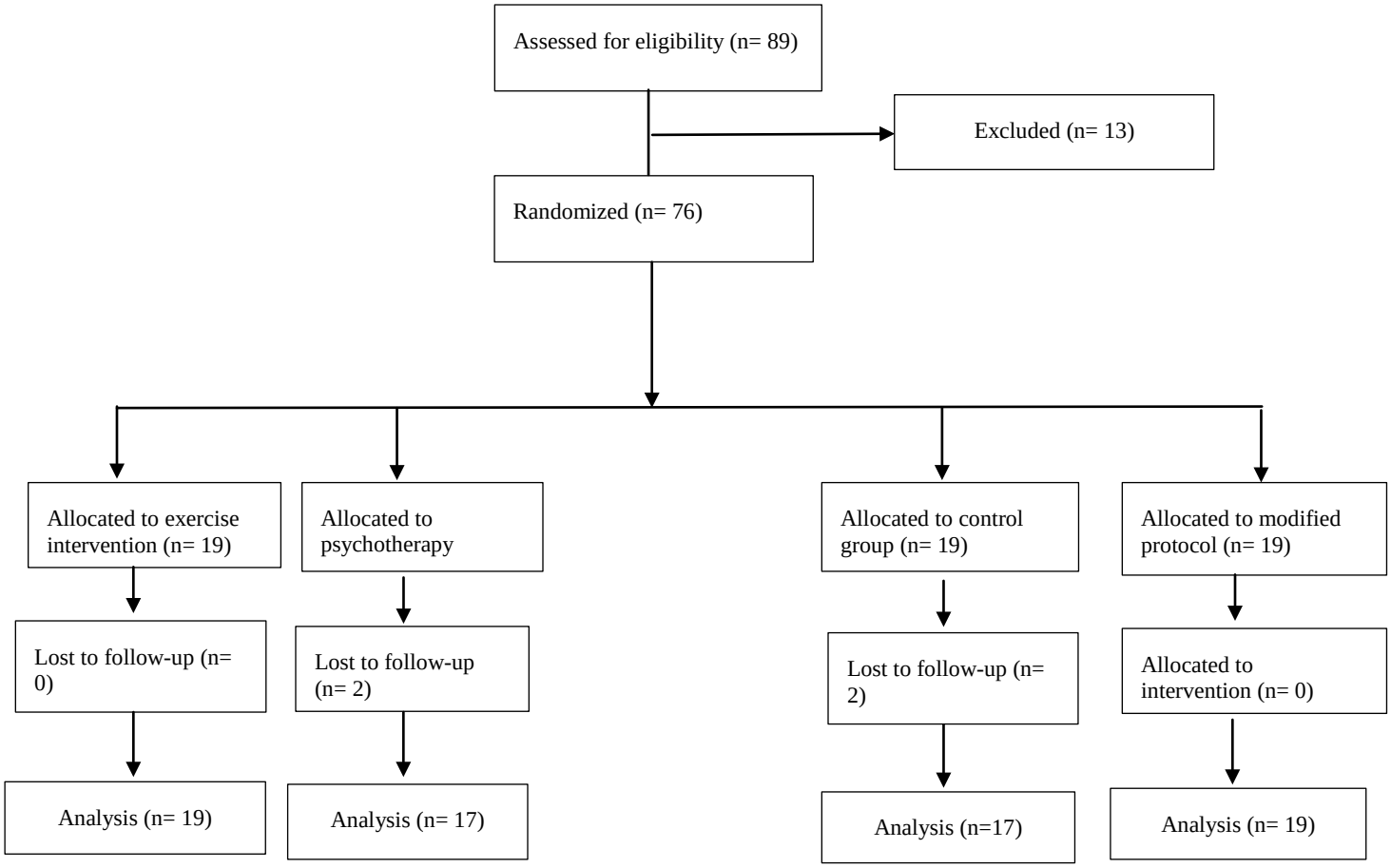

Fig 1. Sampling frame of the study