

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

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This study aimed 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. In this clinical trial, 72 office workers aged 20 to 50 years with chronic low back pain were randomized to one of four groups including; group 1, exercise therapy; group 2, psychotherapy (relaxation therapy); group 3, modified protocol (exercise therapy followed by relaxation therapy); group 4, control group (no intervention). Participants exercised 3 times weekly for 6 weeks for 40–45 min of exercise/relaxation. Pain intensity, ROM, anxiety, and QoL were evaluated at baseline, 6 weeks, and 12 weeks after the end of the intervention. Results showed significant decreases in pain intensity and anxiety in the three experimental groups compared to the control group. The three in-

tervention groups indicated a significant decrease in pain intensity and anxiety after 6 and 12 weeks. ROM significantly improved in the exercise therapy and the modified protocol over time (after 6 and 12 weeks). A significant difference in QoL was found between the groups, with the greatest improvement found in the psychotherapy and modified protocol groups. This therapeutic package (including exercise movements and psychological interventions) was found to have a superior effect on pain intensity, ROM, anxiety, and QoL after 6 and 12 weeks compared to other interventions (only exercise and psychotherapy).

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

## INTRODUCTION

Lower back pain (LBP) is a common condition which impacts 85%–90% of people in both developed and developing countries (Asadi et al., 2016; Mehrdad et al., 2016; Mohseni-Bandpei et al., 2017). Most people have experienced LBP at least once in their lives, especially the nonspecified 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 (Maher et al., 2017; Synnott et al., 2015). If individuals do not take their LBP seriously, the pain

may continue, intensify, and may ultimately lead to disability (O'Sullivan et al., 2019). 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 (Natour et al., 2015; Richmond et al., 2015).

Due to prolonged sitting and inactivity in office workers, LBP is a common cause of disability (Matsudaira et al., 2012). The economic burden of LBP is exponential and driven by the loss of productivity and early retirement (Shariat et al., 2017). Therefore, understanding and identifying the factors that increase the risk of

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Received: August 20, 2019 / Accepted: September 18, 2019

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LBP are necessary, while developing effective rehabilitation strategies for work-related LBP (Steffens et al., 2016). Research has shown that LBP is a multifactorial disorder with several physical and psychological risk factors. Physical factors include stature, body mass, age and body mass index. Psychological factors include mental fatigue, anxiety and depression (Stubbs et al., 2016; Yang et al., 2016). In this regard, workplace stress can cause the lower back muscles to spasm, and increase the incidence of LBP. This is exacerbated by prolonged periods of sitting and general sedentari-ness in office workers (Hurwitz et al., 2005; Stubbs et al., 2016; Synnott et al., 2016). Hence, both the physical and psychological wellbeing of an individual with LBP needs to be addressed in the management of LBP. Recently, new treatment methods based on physical exercise have been proposed, but these methods generally focus on the full length of the spine (Miyamoto et al., 2019; Shariat et al., 2018). 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 a recent research in 2017 (Shariat et al., 2018) with the purpose of representing an intervention that addresses both physical and psychological wellbeing.

## MATERIALS AND METHODS

The present study was a single-blind randomized control trial with parallel groups. In this study, office workers with chronic LBP were selected. Following ethical approval (IRCT20171111 037388N2, Tehran University of Medical Sciences), participants provided full written consent prior to participation. The inclusion criteria for enrollment was class 11, I American Society of Anaes-thesiologists physical status classification, aged 20–50 years, chronic LBP for more than 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 magnetic resonance imaging (MRI). The 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 qual-ified physician and underwent an MRI scan to determine the extent of damage in the lower back region.

Based on the randomized block design, participants were ran-domly assigned into one of four parallel study arms; group 1, ex-ercise therapy; group 2, psychotherapy (relaxation therapy); group

3, modified protocol (exercise therapy followed by relaxation ther-apy); group 4, control group (no intervention). Physical exercises and relaxation techniques were shown to clinical staff via an in-structional video. Participants were required to complete three nonconsecutive sessions per week for 6 weeks, for 40–45 minutes for each training session.

The physical exercise component included 13 simple exercise movements that had to be performed 3 times a day for 10 repeti-tions. The exercises were derived from Williams and McKenzie and followed the recommendations of the American College of Sports Medicine. This protocol was previously introduced by Sha-riat et al. (2017) as an effective protocol for LBP. The relaxation component was based on the stress management model, and fol-lowed guidance provided by Conrad et al. (2007). To perform this test, participants were instructed to relax for 8 min while they sat on a comfortable chair in a large room with appropriate light and temperature without any noise. Participants were then asked to breathe at their usual depth and rate and then for 4 min they were required to inhale for a count of 10 and to exhale for a count of 10 while thinking of the word “relax.” During the test their eyes were open and they were asked to breathe through their nose.

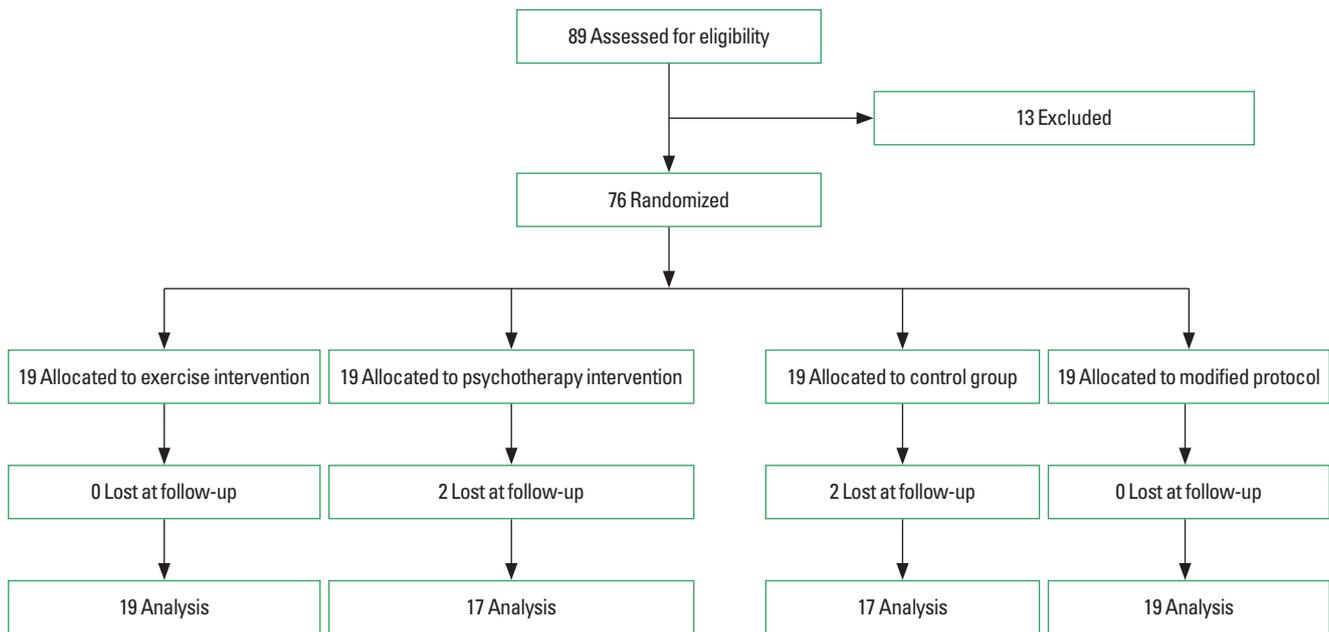
The modified protocol required the participants to perform the relaxation training for 20–25 minutes. Each session was led by a sports psychologist. This was followed by the physical exercise component (Conrad et al., 2007).

## Outcome measurements

The outcome measurements included the evaluation of quality of life (QoL) using the QoL questionnaire (Burckhardt and Ander-son, 2003), anxiety and depression using the hospital anxiety and depression (HADS) questionnaire (Montazeri et al., 2003), the se-verity of pain based on the Functional Rating Index test (Ceran and Ozcan, 2006) and the hips’ range of motion (ROM) using the Thomas test before the treatment, at 6 weeks after the end of the intervention, and 12 weeks following the intervention. Cronbach alpha of the Iranian HADS questionnaire was obtained between 0.78 and 0.86 for anxiety and depression, 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 partici-pants with an additional 20% added due to likely attrition over the 6-week intervention. As such, 34 participants were required for each group.



**Fig. 1.** Sampling framework of the study.

### Data analysis

To evaluate the normality of the data, a Kolmogorov–Smirnov test was performed. The distribution of all of the 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 and time were determined using a mixed model of analysis of variance. The data analysis was carried out using IBM SPSS Statistics ver. 22.0 (IBM Co., Armonk, NY, USA).

## RESULTS

Of the 89 participants who volunteered for the study, 76 were eligible to participate. Of the initial 76 participants, 72 (95%) completed the study. Four participants did not complete the study due to falling ill (Fig. 1).

No significant differences were found at baseline between the four groups. Data revealed a significant improvement in the ROM of the exercise therapy and modified protocol groups when compared to the control and the psychotherapy groups. The results showed that there was a significant group-by-time interaction effect and a main effect for time ( $P < 0.001$ ). The Bonferroni test revealed a significant improvement in the ROM of the modified protocol after 6 and 12 weeks, but no significant effect between 6 and 12 weeks (Table 1).

**Table 1.** Study arm data for range of motion (ROM), pain, quality of life, and anxiety at each time point (n=72)

Variable	Exercise therapy (n=19)	Psychotherapy (n=17)	Modified protocol (n=19)	Control (n=17)
<b>ROM (°)</b>				
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
<i>P</i> -value	0.040	0.050	0.010	0.120
<b>Pain</b>				
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
<i>P</i> -value	0.020	0.030	0.020	0.130
<b>Quality of life</b>				
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
<i>P</i> -value	0.060	0.040	0.010	0.170
<b>Anxiety</b>				
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
<i>P</i> -value	0.010	0.040	0.010	0.170

Values are presented as mean ± standard deviation unless otherwise indicated.

The pain intensity in all intervention groups significantly decreased. The time effect was also significant in the all intervention groups. *Post hoc* analysis revealed that pain reduced after 6 and 12

weeks ( $P < 0.001$ ). However, no significant difference was found between 6 and 12 weeks (Table 1).

The QoL significantly increased after the psychotherapy and modified protocol groups compared with the exercise therapy and control groups. Group-by-time interaction effect and a main effect for time revealed an improvement in QoL after 6 and 12 weeks in the psychotherapy and modified protocol groups ( $P < 0.001$ ). There was no significant difference between 6 and 12 weeks (Table 1).

Anxiety and depression decreased significantly in all three intervention groups compared to the control group. Also, there was a main effect of time on anxiety and depression. *Post hoc* analysis did not show any significant difference in anxiety and depression between weeks 6 and 12, but anxiety did significantly decrease after 6 and 12 weeks compared to baseline in all the intervention groups ( $P < 0.001$ ) (Table 1).

## DISCUSSION

This study aimed to determine the effectiveness of a modified protocol of exercise therapy combined with psychotherapy on office workers suffering from LBP. Exercise therapy by itself and concurrent with relaxation is currently used in the treatment of patients with CLBP. It is considered as an effective therapy for increasing ROM. Improvement in ROM is attained due to increased blood flow to muscles and reduced stiffed joints (Gordon and Bloxham, 2016). The results indicated that the modified protocol and exercise therapy increase ROM. The effect of exercise on flexibility and ROM is well known since exercise results in the mechanical stretching of the tendons, intramuscular connective tissue and other passive skeletal structures (Kubo et al., 2001; Morse et al., 2008). This increase in ROM as a result of exercise is essential to improve or eliminate impairments in back flexibility that can result in alteration of the relaxation response of the paraspinal musculature associated with full spinal flexibility and shortening of muscles and connective tissues of the spinal region (Rainville et al., 2004). In addition, it was found that the effectiveness of these therapies lasts for 3 months after the therapy sessions have ended. The results of this study are in line with those of Gordon and Bloxham (2016), Freimann et al. (2015), and Kim et al. (2015) which similarly showed that multidimensional interventions are effective in the treatment of LBP. As such, interventions which focus on both the physical and mental components of pain can have positive effects, but previous published studies are limited in this field (Hoffman et al., 2007; Niknejad et al., 2018; Weisenberg, 1987).

The results showed that exercise therapy, psychotherapy, and the combination of both treatments 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. (2005) progressive resistance exercises, which strengthen the abdominal and spinal muscles are effective in reducing the pain in individuals with LBP. Also, this finding is consistent with that of Good who reported that psychotherapy (relaxation techniques) is effective in the treatment of employees with LBP (Good, 1995). Further, a study by Okhovatian et al. (2003) showed that exercise therapy using similar exercises to those prescribed in the present study revealed significant reductions in the pain intensity associated with LBP. While all intervention groups observed a reduction in pain, it is important to note that they would have done so via divergent analgesic pathways, while the combined treatment group may have benefited from both exercise and psychotherapy. Exercise may reduce pain via an enhanced blood flow, which is thought to help in dissipating algogenic chemicals, by facilitating muscle relaxation and activation of supraspinal pathways or by reducing peripheral edema by virtue of its effect on the cardiovascular system and by centrally dampening sympathetic nervous activity (Hall et al., 2008). It is important to note that psychotherapy does not directly address the physiological component of pain in LBP, but rather results in the reframing of maladaptive thoughts and coping strategies, which may, reduce the pain experience associated with LBP (Gatchel and Rollings, 2008).

The present study demonstrated an improvement in the QoL in the psychotherapy and modified protocol groups. The results of this study are in line with those of Tavafian who concluded that an educational program promoted the QoL of women suffering from a LBP (Tavafian et al., 2007). Although this study is different from the current study in terms of intervention type and research population, the results indicate that the QoL of individuals suffering chronic LBP can be affected by their mental issues (Hornig et al., 2005). In the present study, it appears that psychotherapy, either alone or combination, improves QoL. Psychotherapy may have improved QoL due to its ability to expand the patients' repertoire of effective coping skills and by fostering realistic hope and optimism, while enhancing wellbeing (Courneya et al., 2003). While psychotherapy is the "gold standard" to improve QoL, it was disappointing that our exercise intervention did not produce improvements in QoL, since psychotherapeutic interventions are less likely to address the physical and functional problems encountered by patients with LBP, such as reduced cardio-

pulmonary function and loss of muscle strength (Courneya et al., 2003), hence the need for a combined intervention.

The results of the present study showed a significant improvement in anxiety and depression in all the intervention groups. In line with the present study, Diepenmaat et al. (2006) showed that musculoskeletal pain is associated with depression and stress. Either psychotherapy or exercise alone was sufficient to improve anxiety and depression. The finding in this study and in previous studies that exercise is equally powerful to psychotherapy in improving anxiety and depression is essential in that many individuals avoid psychotherapy because of perceived stigma (Mead et al., 2009). While there is evidence that psychotherapy and exercise are effective in treating anxiety and depression alone, the mechanisms by which this occurs are unclear (i.e., treating the primary symptoms of depressive disorders or whether the effect was achieved through other mechanisms such as simple recovery from/improvement in LBP) any future understanding of the mechanisms by which psychotherapy and exercise improve anxiety and depression may help to determine their potential overlapping or complementary nature (Byrne and Byrne, 1993).

A modified protocol utilizing a combination of exercise therapy and psychotherapy can improve pain, anxiety, ROM and QoL in office workers with LBP. In fact, this study confirmed that a multidisciplinary intervention is needed in the treatment of LBP in office workers.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

## ACKNOWLEDGMENTS

This study was supported and approved by Tehran University of Medical Sciences (IR.TUMS.VCR.REC.1396.4380).

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