Relaxation Techniques in Low Back Pain Patients: A Randomized Controlled Trial

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ABSTRACT: Low back pain (LBP) is a common problem, affecting 11% of the population in Greece. Pain can last upwards of 6 wk and impact functional ability and quality of life. Treating LBP often includes the use of alternative methods, such as relaxation techniques. We tested whether relaxation techniques could reduce stress and pain and improve quality of life. Patients engaged in methods such as diaphragmatic breathing, progressive muscular relaxation, autogenic training, and guided imagery. The treatment group consisted of 31 randomized patients and the control group had 33. The treatment group followed an 8-wk relaxation program with weekly sessions and practiced techniques every day by listening to a compact disk at home (2×/d). The control group did not follow relaxation techniques. No statistically significant differences were present regarding the Perceived Stress Scale, body-mass index, and satisfaction with functional ability. However, statistically significant differences were found in the Brief Pain Inventory score and multidimensional locus of control. We also found decreases in all three cortisol measurements for the treatment group. Relaxation techniques provide positive results in pain reduction and cortisol decrease and must therefore be incorporated into rehabilitation protocols.

KEY WORDS: low back pain, relaxation techniques, progressive muscular relaxation, autogenic training, guided imagery

I. INTRODUCTION

Nonspecific low back pain (LBP) is defined as pain that lasts for 6 wk to 12 mo. It is described as tension, soreness, and/or stiffness in the thoracolumbar spine, but no definite diagnosis exists for these symptoms. Several structures in the back, including joints, discs, and connective tissues, may contribute to symptoms. Some with nonspecific LBP may also experience pain in proximal lower limbs, but LBP usually predominates.[1,2]

During recent years, treatment improvement has occurred with evidence-based management of LBP.[2] But, diagnostic and therapeutic algorithms have been characterized with considerable variation within and between countries among general practitioners, medical specialists, and other healthcare professionals. Treatment duration can last for up to 6 wk, but LBP treatment in patients with symptoms for > 6 wk remains debatable.[1] Normally, nonspecific LBP becomes self-limiting within a few weeks, and 3%–10% of patients develop persistent pain.[3] Disabling long-term back pain can result in socioeconomic impact, so a main treatment goal is to reduce the number of individuals inflicted with debilitating pain.[1,4] Conservative treatment includes medication, physiotherapy, exercise, epidural injections, spinal manipulation, and cognitive behavior therapy.[5] For patients with persistent nonspecific LBP, strong recommendations exist for self-management using appropriate advice and information. Most individuals will experience at least one episode of LBP during their life. Reported lifetime prevalence varies from 49% to 70% and point prevalence from 12% to 30%.[4] According to an epidemiological study of rheumatic diseases in Greece, in 2002 the prevalence of pain in adults was 11%. The pain continued to increase for years and was more common among adult women.[5] Lifetime prevalence of LBP (at least one episode during a lifetime) in developed countries is reported at 85%.[6] A significant number of patients develop chronic/long-term LBP, defined

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as pain persisting for more than 3 mo.[7,8] These patients also suffer from psychological distress and reduced physical function.[9] In Australia, 10% of the population suffer from long-term LBP, and in 2004 it was considered to be the most prevalent and single most costly musculoskeletal disorder.[10,11] These data are consistent with that of other industrialized countries of the world. In the US, spinal disorders are the most common cause of limited activity in individuals under 45 yr, accounting for 57.1% of all musculoskeletal impairments in those aged to 65 yr.[12] Similarly in the UK and Sweden, LBP was estimated to be the single largest cause for work absence.[13] Apart from mechanical causes and injuries, LBP is also connected with stress and psychological factors. Therefore, apart from traditional therapies, stress management techniques are used to relieve stress and tension accompanying LBP.[14]

A recent review of commonly used therapies for chronic LBP showed that psychological interventions (e.g., cognitive behavioral therapy and progressive relaxation), interdisciplinary rehabilitation, spinal manipulation, and exercise therapy were all moderately effective compared to placebo or sham therapies.[14] According to several studies, among older adults, chronic LBP is a common condition that can have devastating consequences. Chronic pain is associated with depression, stress, decreased appetite, impaired sleep, and overall decreased quality of life.[15–18] Approximately 25%–30% of older adults suffer from chronic LBP.[19,20] In many cases of LBP in older adults, the disease is inadequately treated. This may be due to older adults' increased susceptibility to medication side effects and increased number of comorbidities that prohibit surgical interventions.[21]

Approximately one-third of older adults have used complementary and alternative medicine (CAM),[22] and one of the most common conditions for CAM is chronic LBP.[22,23] The growing use of CAM has raised the need for scientific research. In the present study we focus on the effects of combined use of relaxation techniques such as diaphragmatic (deep) breathing, progressive muscular relaxation (PMR), autogenic training, and guided imagery in patients suffering from chronic LBP.[24]

The main purpose of the present study was to assess the feasibility of recruitment and adherence to a combined program including relaxation techniques divided into eight sessions that addressed adults with chronic LBP. The secondary aim was to develop initial estimates of treatment effects on pain assessment, perceived stress, Multidisciplinary Health Locus of Control (MHLC), and cortisol levels in chronic LBP patients.

II. MATERIALS AND METHODS

This study was designed as a randomized controlled trial (RCT). Patients suffering from LBP were candidates for inclusion; overall, 108 patients were assessed at the outpatient clinic of our department. Before study enrollment began, our institutional review board approved the study, and all enrolled patients provided written informed consent. Among the 108 patients, 78 met inclusion criteria, but two did not consent, which left us with 76 patients for further analysis. Patients were prospectively randomized using sealed envelopes to be placed either in the intervention (treatment) group or control (no treatment) group. Each group included 38 patients. Seven patients from the intervention group and five from the control group were lost during the follow-up, so the final number of patients included were 31 in the intervention group and 33 in the control group (Fig. 1).

Regarding medical history, all patients were asked to complete questionnaires that focused on LBP. We used the Brief Pain Inventory (BPI) and McGill Questionnaire to assess LBP intensity and its effect on daily functioning. Also used was a questionnaire that was created by a stress management and health promotion postgraduate course that asked patients about everyday lifestyle and routine, dietary and sleeping habits, health factors, smoking, and an extended list of stress-related symptoms. Additionally, it contained general questions regarding demographic features such as occupation, level of education, place of residence, and income satisfaction. We also used the Perceived Stress Scale (PSS) and MHLC. Both were translated and adjusted into the Greek language. Cortisol blood levels were assessed at the beginning of the protocol

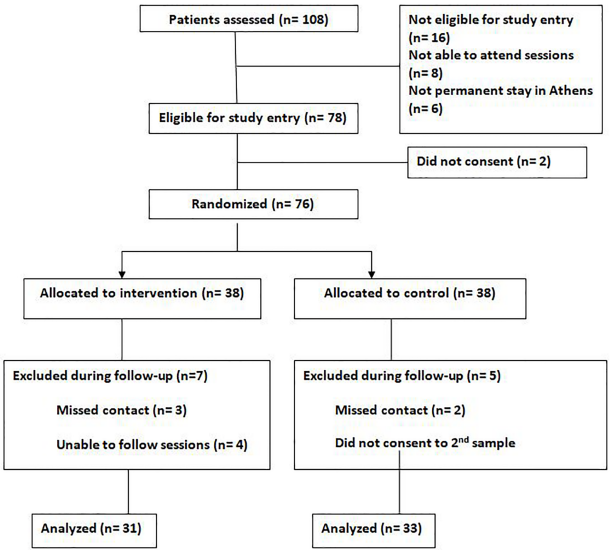

FIG. 1: Study flowchart

and after therapy completion. Patient demographic data and baseline measurements were recorded (see Table 1).

We performed a statistical analysis using the Statistical Package for the Social Sciences, version 20 (IBM, Armonk, NY). A Q_Q plot was used to check sample distribution normality. Because the sample was relatively small ($n = 33$ controls; $n = 31$ in the intervention group), no normality was found. We used the Mann–Whitney U test and Pearson's correlation coefficient to check for statistically significant differences in measurements before and after intervention and between groups. Statistical significance was indicated by $p < 0.05$.

III. RESULTS

We found a statistically significant difference in MHLC for each subscale between the two groups (Table 2). No statistically significant differences occurred for BMI ($p = 0.020$) nor cortisol levels. Differences were higher for the treatment group. Statistically significant differences were found for BPI scoring ($p < 0.001$), with differences higher in the treatment group compared to controls. A greater improvement in pain occurred for the treatment group than for controls. Nevertheless, we found no statistically significant difference in PSS before and after intervention ($p = 0.366$). Additionally, no

TABLE 1: Baseline details of patients included in this series

Variable	Control group ($n = 33$)	Study group ($n = 31$)	*p value*
Age (mean ± SD)	64.52 ± 13.224	62.39 ± 9.976	0.224
Years of education after high school (mean ± SD)	1.48 ± 2.048	2.06 ± 2.581	0.384
PSS (mean ± SD)	37.12 ± 5.840	39.68 ± 5.381	0.109
Cortisol 1 (mean ± SD)	0.711 ± 0.249	0.777 ± 0.296	0.292
Cortisol 2 (mean ± SD)	0.6155 ± 0.242	0.668 ± 0.232	0.200
Cortisol 3 (mean ± SD)	0.29059 ± 0.081	0.326 ± 0.143	0.412
Female (*n* [%])	27 (81.8)	22 (71.0)	0.233
Married (*n* [%])	15 (45.5)	22 (71.0)	0.088
Currently smoking (*n* [%])	10 (30.3)	3 (9.7)	0.005
BMI (mean ± SD)	26.990 ± 5.5946	34.513 ± 4.3731	0.382
Satisfaction with existing salary (*n* [%])			
None	7 (21.2)	2 (6.5)	0.364 (none/little vs. average/high satisfaction)
Little	4 (12.1)	3 (9.7)	
Average	17 (51.5)	21 (67.7)	
High	5 (15.2)	5 (16.1)	

BMI, body-mass index; PSS, perceived stress scale; SD, standard deviation.

TABLE 2: Outcome changes

Difference (Δ)	Control group (*n* = 33)	Study group (*n* = 31)	*p value*
BMI (mean ± SD)	–0.879 ± 0.90165	–0.839 ± 1.66275	0.200
PSS (mean ± SD)	–4.3939 ± 5.1656	–2.7419 ± 3.13015	0.366
MHLC 1 (mean ± SD)	0.667 ± 2.41954	–3.0968 ± 3.49623	< 0.001
MHLC 2 (mean ± SD)	–1.0606 ± 2.54877	2.2258 ± 4.99806	0.001
MHLC 3 (mean ± SD)	0.000 ± 2.10654	1.9355 ± 3.62340	0.005
Cortisol 1 (mean ± SD)	–0.0570 ± 0.163	0.1635 ± 0.15380	< 0.001
Cortisol 2 (mean ± SD)	–0.0642 ± 0.18441	0.1065 ± 0.12262	< 0.001
Cortisol 3 (mean ± SD)	–0.0328 ± 0.05551	0.0589 ± 0.8002	< 0.001
*Satisfaction (mean ± SD)	3.333 ± 1.94722	1.6774 ± 3.833	0.076
BPI (mean ± SD)	5.4545 ± 2.89494	22.1935 ± 7.7003	< 0.001

*Satisfaction from performance of everyday activities and quality of life.
BMI, body-mass index; BPI, brief pain inventory; MHLC, multidisciplinary health locus of control; PSS, perceived stress scale; SD, standard deviation.

significantly greater patient satisfaction was found for the treatment group compared to controls.

IV. DISCUSSION

Relaxation techniques proved to be very effective for treating chronic LBP. Importantly, patients changed their way of thinking about matters concerning health, which could possibly lead to improved quality of life. According to our results, applying relaxation techniques reduced cortisol levels, an indication of restricted inflammation processes, leading to reduced pain. Differences in PSS scores were not significant in the intervention group, but pain intensity and occurrence reduced. The fact that performance regarding everyday life–related demands did not show improvement practically translates to unchanged functional ability. Noting that baseline limitations in everyday activities was not high meant that patients initially did not score high disability values even with LBP; thus, they were able to come to the outpatient clinic and participate in sessions. All patients were initially able to walk and climb steps, so a statistically significant change in functional ability was not expected. Patients should be reexamined (follow-up) after 3 or 6 mo to check long-term effects for pain reduction.

We acknowledge that this study may have important limitations; although prospectively designed, having small sample sizes, and no study group follow-up, differences in activity levels and possible spinal comorbidities may have impacted study results.

It has been proposed that mental health may affect LBP.[24–26] In 2006, Diepenmaat et al.[25] showed that musculoskeletal pain is associated with depression and stress. Recently, Shariat et al.[24] published an RCT examining the effect of exercise and relaxation therapy on LBP in office workers. The authors showed that apart from pain reduction, their proposed protocol may offer a significant improvement in anxiety and depression and quality of life in general. Similarly, an older RCT by Tavafian et al.[26] concluded that an education program promoted quality of life in women suffering from LBP, but the intervention type and research population was different from those in our study.

BMI did not practically change after the stress management program. A reduction in body mass was not expected, though, because the intervention program focused on LBP and its reduction. Patient nutrition was not expected to alter after treatment. A BMI reduction may be achieved with longer-term intervention combined with dietary education from a specialist.

The most important study finding was that the change in BPI scoring reached statistical significance, showing great improvement regarding pain reduction. This outcome reinforces the concept that relaxation techniques must be incorporated into

rehabilitation programs for chronic LBP. Range of motion enhancement as a result of exercise is essential to improving or eliminating impairments in back flexibility. Such impairments can alter the relaxation response of the paraspinal musculature that is associated with full spinal flexibility and muscles and connective tissue shortening in the spinal region.[27] Moreover, Good reported that psychotherapy (relaxation techniques) is effective in treating employees with LBP.[28] Multidisciplinary rehabilitation programs must be carefully designed and applied to all populations and age groups.

In conclusion, relaxation techniques are an easy and cost-effective method for chronic pain treatment. Pain reduction using nonpharmacological methods may contribute dramatically to reducing economic and social costs of LBP, especially for older patients, who may not be able to overcome medication side effects. Diaphragmatic breathing, PMR, autogenic relaxation, guided imagery, and other techniques that were not examined in this research may be a valuable solution for pain and stress management.

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