International Journal of Sport Studies. Vol., 3 (6), 599-605, 2013
Available online at http: www.ijssjournal.com
ISSN 2251-7502 © 2013 VictorQuest Publications

The Comparison of Three Rehabilitation Protocol on Pain and Performance in Women Patients with Non-Specific Chronic Low Back Pain

Sousan Khademi Nejad[1]*, Ahmad Ebrahimi Atri[2], Sayed Ali Akbar Hashemi Javaheri[2], Hadi Akbari[3], Narjes Kheirabadi[4]

1- MSc Student in Corrective Exercise and Sport Injury, Ferdowsi University of Mashhad, International Branch, Mashhad, Iran
2- Associate Professor in Sport rehabilitation, Department of Physical Education and Sport Science, Ferdowsi University of Mashhad, Mashhad, Iran
3- Lecturer in Corrective Exercise and Sport Injury, Department of Physical Education and Sport Sciences, University of Zabol, Zabol, Iran
4- Bachelor in Physiotherapy

****Corresponding author,*** **Email:** sussankhademinejad@gmail.com

Abstract

Although various treatment methods have been applied to low back pain, there is no general consensus on the most effective treatment. The aim of this study was to compare of three rehabilitation protocol: core training, core training plus electrotherapy and electrotherapy only on pain and performance in women patients with non-specific chronic low back pain. Forty-five females with the mean and standard deviation of age (42.77 ± 6.51 years), weight (65.87± 7.94 kg) and height (159.02 ± 6.61 cm) with chronic low back pain were participated in the study. They were randomly divided into three groups: Core training (n = 15), Core training plus electrotherapy (n = 15) and electrotherapy only (n = 15). Before and after the intervention, visual analogue scale (VAS) and the oswestry disability index were used to assess pain intensity and disability, respectively. The Paired T-Test and one-way ANOVA test findings show that intensity pain variable was significantly decreased in three protocols (P<0.01), while no significant change was found in the disability variable in the electrotherapy protocol (P>0.05). When three groups compared, level of pain was no found to be statistically significant (P>0.05) but functional disability was found to be statistically significant (P<0.05). The findings of this study revealed that core stability training may decrease the pain intensity and disability.

Keywords: Core stability training, Electrotherapy, Nonspecific chronic low back pain.

Introduction

Chronic low back pain (CLBP) is a common, debilitating, and costly health problem (Centers for Disease Control and Prevention, 2001). The prevalence of chronic low back pain is higher in women and in whites versus blacks (Mapel et al., 2004). Treatment guidelines issued in the United States (Chou et al., 2007) and Europe (Airaksinen et al., 2006) both state that back pain becomes chronic if it persists for ≥12 weeks. United States guidelines also distinguish between acute (<4 weeks) and subacute (4–<12 weeks) back pain (Chou et al., 2007). Chronic low back pain has become a main cause of absenteeism and disability in industrialized societies and is a major health problem with enormous economic and costs (Andersson, 1999). From an economic point of view, low back pain (LBP) is one of the most emerging and cost-pushing health disorders in the western world, and for the majority of cases neither direct organic signs nor structural correlates can be identified (Waddell et al.,

1980). According to McGill (2007, p. 5), more than 80% of all patients with back complaints suffer from non-specific low back pain.
Several influencing factors are discussed to be essential in the etiology of low back pain, such as psycho-social components (Waddell et al., 1980), and organic mechanisms in terms of spinal instability due to ligament function and deficits in neuromuscular coordination and compensation: neutral zone spinal instability hypothesis (Panjabi, 1992). With respect to these biomechanical and social-medical findings, and being aware of muscular dysfunction in LBP patients compared to pain free volunteers (Cady et al., 1979; Denner, 1997; McNeil et al., 1980), reconditioning of muscle function and neuromuscular coordination patterns is supposed to be a successful intervention mode in the therapy of low back pain (McGill, 2007; Panjabi, 1992; Waddell et al., 1980), especially when segmental stabilization is taken into account (O'Sullivan et al., 1997; Richardson et al., 2004).
Electricity has been used to treat pain for over 100 years. Early proponents of electricity were labeled as charlatans, but recent scientific studies have proven that electricity can reduce both acute and chronic pain. Specific to electrotherapy modalities, multiple devices producing varying electronic waveform types, wave frequency, and wave amplitude are used for analgesic relief of chronic pain conditions, including nonspecific low back pain. An evidence based review of electrotherapy literature identified a modest number of moderate and low quality trials that demonstrated evidence of transcutaneous electrical nerve stimulation (TENS) efficacy for select patients with chronic low back pain (Hegmann et al., 2008; Van Middelkoop et al., 2011; Buchmuller et al., 2012; Furlan et al., 2012).
The lumbopelvic (core) stabilization model is an active approach to low back pain, as proposed by Waddel (Waddel et al., 1997), based on a motor control exercises program. The main aim of this program is to reestablish the impairment or deficit in motor control around the neutral zone of the spinal motion segment by restoring the normal function of the local stabilizer muscles. Stabilization exercise program has become the most popular treatment method in spinal rehabilitation since it has shown its effectiveness in some aspects related to pain and disability. Lumbopelvic (core) stabilization approach seems to be useful for the management of low back pain. Based on a solid biomechanical model (Panjabi's hypotheses), it has demonstrated positive effects over pain and return to activity, but it is not clear the optimal type of exercise, duration or number of repetitions, among other variables. Furthermore there is no strong evidence that conclude whether core stabilization exercise provide better results than other different methods such as electrotherapy or electrotherapy plus core stabilization exercises. Identification of efficacious noninvasive, nonpharmacologic therapies could yield meaningful gains and result in substantial population improvement in morbidity and costs associated with LBP. Unfortunately, many of the treatments used today are not strongly effective (Carragee 2005). Although various treatment methods have been applied to low back pain, there is no general consensus on the most effective treatment. Further research focusing on these topics is needed. So, the aim of this study was to compare of three rehabilitation protocol: core training, core training plus electrotherapy and electrotherapy only on pain and performance in women patients with non-specific chronic low back pain.

Materials and Methods

Forty-five females with the mean and standard deviation of age (42.77 ± 6.51 years), weight (65.87± 7.94 kg) and height (159.02 ± 6.61 cm) with chronic low back pain were participated in the study. They were randomly divided into three groups: Core training (n = 15), Core training plus electrotherapy (n = 15) and electrotherapy only (n = 15). Before and after the intervention, visual analogue scale (VAS) and the oswestry disability index were used to assess pain intensity and disability, respectively. Core stabilization group went through an individualized exercise program for a time period of 6 weeks from pre- to post-testing. There were 18 training sessions altogether, normally three sessions per week. Every session took 45 minutes and followed a fixed schedule of phases: a systematic warm-up (5 min), stretching as well as Core stabilization exercises (6 exercises). But the exercise program was dominated by Segmental Stabilization Training (SST), which was learned and re-learned in every session in a basic exercise and which was static and dynamic tasks with an emphasis on the special SST-coordination (segmental stabilization means a special coordination pattern to involve deep trunk and lumbar back muscles) pattern. All exercises were performed for one to three sets, with an intensity that allowed 10 to 15 repetitions or 20 to 30 seconds of static resistance, respectively. Number of sets and reps (volume and intensity and the choice of exercise itself (content) were determined by individual findings in the pre-test and anamnesis information right before starting the intervention. Training was conducted and controlled by physiotherapist.

Electrotherapy was included TENS (20-30 minutes), US (3-10 minutes) and IR (15-20 minutes with TENS). Electrotherapy was performed every other day for 6 weeks. Paired T-Test and one-way ANOVA (SPSS 18) were calculated to analyze independencies of variables. Significance was accepted for p-values of $p \leq 0.05$.

Results

Normal distribution was proved using the Kolmogorov-Smirnov-test. Participants in three groups (n= 15) were comparable at baseline, as shown in Table 1.

Table 1: Summary (mean ± SD) of Subject characteristics and demographic data of 3 groups

Statistical test result	Core training plus Electrotherapy(mixed)	Electrotherapy	Core stabilization exercises	Groups
F= 0.941 Df=42 P= 0.398	44.40±5.35	42.80±6.82	41.13±7.22	Age(year)
F= 0.562 Df= 42 P= 0.574	66.33±8.18	64.13±7.44	67.13±8.41	weight(kg)
F= 1.121 Df= 42 P= 0.0336	159.60±7.76	157.00±6.22	160.46±5.62	Height(cm)
F= .0285 Df= 42 P= 0.754	45.47±7.24	46.00±9.30	47.67±8.31	Pain (before Intervention)
F= 1.936 Df= 42 P= 0.157	40.00±5.85	39.20±6.27	43.33±6.17	Disability (before Intervention)

Comparison of the pre intervention and post intervention outcome measures within the group was done by using Paired t-test. ANOVA test was utilized to measure the difference between three groups (Intergroup comparison).
Intensity pain variable was significantly decreased in three protocols (P<0.01) (Table 2), while no significant change was found in the disability variable in the electrotherapy protocol (P>0.05) (Table 3).

Table 2: Dependent T-test results in the pain intensity variable

T	P	D	Group	variable
13.73	0.001	19.87±5.60	Core stabilization exercises	Pain intensity
14.40	0.001	18.53±4.98	Electrotherapy	
19.68	0.001	22.47±4.42	Core training plus Electrotherapy(mixed)	

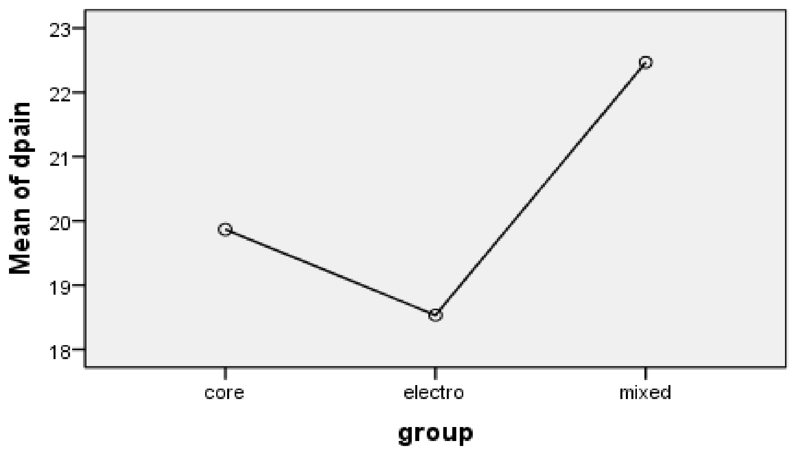

Figure1: Comparison of mean difference of pain, before and after the 6-week programme of treatment intervention

Table 3: Dependent T-test results in the disability variable

t	P-Value	D	Group	variable
4.84	0.001	9.47±7.58	Core stabilization exercises	disability
1.85	0.085	2.80±5.85	Electrotherapy	
4.82	0.001	9.60±7.72	Core training plus Electrotherapy(mixed)	

When three groups compared, level of pain was no found to be statistically significant (P=0.105, $F_{2,42}$=2.376). In this study, functional disability was found to be statistically significant (P=0.017, $F_{2,42}$=4.50). The result of tukey test in table 4 explained significant difference between core stabilization exercises and mixed groups with electrotherapy group in regard the disability variable ($\alpha < 0.05$).

Table 4: Tukey Test results the disability variable

Sig.		
0.036*	Electrotherapy	Core stabilization exercises
0.999	mixed	
0.036*	Core stabilization exercises	Electrotherapy
0.032*	mixed	
0.999	Core stabilization exercises	Core training plus Electrotherapy(mixed)
0.032*	Electrotherapy	

$p<0.05$, *significant at p level of 0.05

Discussion and Conclusion

Chronic low back pain is a significant issue, resulting in significant costs, lost productivity, and morbidity (Gore et al., 2012). Therefore, even small improvements in treatment efficacy, particularly for treatments with few side effects, can have a meaningful impact on improving LBP. The aim of this study is comparing of three rehabilitation protocol: core training, core training plus electrotherapy and electrotherapy only on pain and performance in women patients with non-specific chronic low back pain. The present study showed core stabilization exercises treatment protocol alone in the absence of electrotherapy as core training plus electrotherapy was effective in reducing pain and improving function.

There are an increasing number of clinical studies that have investigated the efficacy of core stability exercise in the management of CLBP. Although early studies were based on audits of clinical outcome (Saal et al., 1989), more recently, high quality randomized controlled clinical trials have been conducted. The first study investigated core stability exercise, from a motor control perspective, in people with CLBP associated with spondylolisthesis (O'Sullivan et al., 1997). In this study, subjects were allocated randomly to either participate in a motor-relearning program or a nontreatment group. The training period lasted for 10 weeks. At the completion of training and at follow-up at 30 months, there was a significant reduction in pain and disability in the motor-relearning group. There was no significant change in the nontreatment group. The second study involved training in acute first-episode unilateral LBP (Hides et al., 1996). This group was selected because they have a reduced cross-sectional area of multifidus ipsilateral to their symptoms (Hides et al., 1994). The intervention involved a 4-week program of motor relearning, focused on multifidus in conjunction with TrA. After 4 weeks, all pain and disability measures had recovered in all but one participant. This is consistent with epidemiologic data. The size of multifidus had recovered only in the motor-control training group (Hides et al., 1996). The follow-up data provide potent evidence for the efficacy of the approach. After 3 years, people in the control group were 12.4 times more likely to have further episodes of pain that those in the exercise group (Hides et al., 2001). Although the data deal with an acute population, they are important to consider here because recurrence of pain is a major factor in CLBP. Another focus of clinical studies has been to identify the mechanism of efficacy of the clinical approach. Improvements in motor control parameters such as muscle activation patterns (O'Sullivan et al., 1998) and performance of specific skilled activities (Jull et al., 2002) have found a positive relationship, however. Thus, there is increasing evidence of efficacy of core stability exercise, particularly from a motor-control perspective, and there is evidence that the improvements are related to the factor being addressed in the intervention.

The role of physical agents in the treatment of low back pain is primarily for pain control and to aid in the healing response in the presence of acute injury. Although many clinical guidelines for low back pain do not recommend passive therapies, this is generally due to the small effect size of individual physical modalities on improving outcomes for people with back pain (Bigos et al., 1994). The exact mechanism of electrical stimulation's beneficial effect remains controversial. Electrical stimulation may directly block transmission of pain signals along nerves. In addition, electrical stimulation has been shown to promote the release of endorphins, which are natural painkillers produced by the body. In recent years, the use of ultrasound (U.S.) has been progressively extended, due to its economy, reliability, relative ease of use and accessibility. Specifically in the back, although it has shown the importance of the deep back muscles by neurophysiological and biomechanical. Ultrasound is gradually taking a greater presence and are identifying themselves as a very useful tool for the assessment and treatment of patients with low back pain (Hides et al., 2001; Kiesel et al., 2007; Kristjansson, 2004; Lee et al., 2007; Rankin et al., 2005; Stokes et al., 2005). Transcutaneous electrical nerve stimulation (TENS) using surface electrodes, using electrical impulses seeking to relieve symptoms by changing the perception of pain (Milne et al., 2001; Brosseau et al., 2002).

An active lifestyle seems to favor the reduction of pain, time to return to work and disability rather than modality treatment. It has also been shown to maintain this level of activity promotes a faster recovery, reducing the risk of relapse and more chronic pathology. It is concluded that for female patients with CLBP the core stabilization exercises only had a better effects than electrotherapy and that the patients who received the exercise therapy had equal outcomes than those receiving core training plus electrotherapy.

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