

Original Article

Implementation of An Adapted Physical Activity Therapy Protocol for Patients with Low Back Pain

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Abstract

This study set out to investigate the usefulness of an adapted physical activity protocol to improve pain and functional capacity through structured adapted exercises to muscular capacity on patients in a Functional Restoration program. Material and methods: 83 patients, aged between 19-63, who accepted to be included in this study and diagnosed as chronic low back pain. The patients were treated for a total of 12 weeks, 3 sessions per week. The level of pain severity of the participants was determined by Visual Pain Scale (VAS). Oswestry Disability Index for functional evaluation; Low Back Pain Disability Index (LBPDI). These assessments were performed at the beginning and end of the 12-week treatment program. In line with our study results, we anticipate that the planned physiotherapy and adapted physical activity (APA) protocol will reduce the health expenditures by finding a solution option for chronic low back pain commonly seen in societies.

1. Introduction

Musculoskeletal disorders are among the main causes of sick leave. Back pain, also known as low back pain, holds a major place there and in the 20th century became one of the most frequent and disabling diseases (Hoy, Brooks, Blyth, & Buchbinder, 2010). Lack of chronic low back pain has existed as a health problem for many years (Mohamed Mohamed et al., 2020). Abenham noted that the vast majority of low back pain (85 to 90%) has no identifiable cause and is said to be non-specific, while specific low back pain has one or more clearly identified cause (s)

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(Abenhaim et al., 2000), Many industrialized countries have had to deal with this real public health problem and continue to address it in the 21st century. The World Health Organization (WHO) has called the years 2000 to 2010 "the decade of bones and joints" (Brongel, Lorkowski, Hładki, & Trybus, 2006), Low Back Pain (LBP) is a multifactorial pathology with a significant impact on quality of life (Grabovac & Dorner, 2019). LBP is pain or functional discomfort in the lumbar region, whether or not associated with radiation to the lower limbs. A distinction is made between acute (<4 weeks), subacute (between 4 and 12 weeks) and chronic (> 12 weeks) low back pain (McIntosh & Hall, 2011). These past two decades, some specific programmes for chronic low back pain have been developed (Liddle, Baxter, & Gracey, 2004; Smeets, Vlaeyen, et al., 2006), These programmes, with validated positive results (Furunes et al., 2017), include multidisciplinary interventions and aim to get people back to work and resume their leisure activities (Li & Bombardier, 2001). In the treatment of patients with chronic low back pain, many physiotherapy and rehabilitation approaches such as hydrotherapy, electrotherapy, massage, thermotherapy, manual therapy, back school, traction and exercise are applied (Maher, 2004; Shipton, 2018), Exercise alone or in combination with education has shown moderate-quality evidence that this is effective for prevention of LBP (Lalia, Ali, Adel, Asli, & Othman, 2019; Steffens et al., 2016). Recommended primary conservative physical treatment preferences include manual therapy, exercise, and superficial heat (Yassin Zenati, Belkadi, & Benbernou, 2021), Physical activity is a major axis of treatment to improve pain and functional capacity through structured exercises, but also to fight against physical deconditioning (Pinheiro & Machado, 2018; Saragiotto & Latimer, 2016).

The aim of Physical activity treatments is to improve function, and to prevent disability from getting worse (Foster et al., 2018). Physical activity (PA) is defined as any movement of the body produced by the contraction of skeletal muscles resulting in the expenditure of energy (Caspersen, Powell, & Christenson, 1985). This includes many sports and hobbies, but also daily activities, exercise programs and work activities (Belkadi et al., 2015; Khasnabis et al., 2010). The practice of Physical Activities is recognized as the main strategy for the management of chronic non-specific low back pain (CNLBP) in international guidelines (Koes et al., 2010). Although there are many reports in the literature on the outcome of physical activities, most are restricted to physical treatment on chronic low back pain and more particularly on the LBP.

2. Material and methods

The aim of this study was to investigate the effects adapted physical activity (APA) protocol to improve pain and functional capacity through structured adapted exercises to muscular capacity on patients in a Functional Restoration program.

The study was conducted between August 2020 to November 2020 on 83 individuals who were admitted to the centre of Physical Therapy and Rehabilitation Unit and diagnosed with chronic low back pain.

Our study was evaluated by the Institute of physical education and sport

Mostaganem University by Research Ethics Committee with the Decision Number 00294/IEPS/2020 on 14/08/2020 and was found suitable for medical ethics.

83 patients, aged between 19-63, who accepted to be included in this study and diagnosed as chronic low back pain, were randomly divided into 2 groups: 1 control and 1 application. All patients (including the control group) underwent a standard physiotherapy program consisting of low back training and spine strengthening and stabilization exercises. The control group received no treatment other than this standard physiotherapy program. In addition to this program, adapted physical activity was applied to the application group. The patients were treated for a total of 12 weeks, 3 sessions per week.

Before the study, all participants were informed about the aim of the study, the treatment methods used, the questionnaires to be applied, the duration of the treatment and the assessments to be made both verbally and in writing and the On “Informed Consent Form” was signed. The level of pain severity of the participants was determined by Visual Pain Scale (VAS) (Kersten, White, & Tennant, 2014; Pathak, Sharma, & Jensen, 2018; Thong, Jensen, Miró, & Tan, 2018). Oswestry Disability Index for functional evaluation (Fritz & Irrgang, 2001; Intensity, 2013). The PDI was designed to measure the extent to which chronic pain interferes with a person's ability to engage in family/home responsibilities, recreation, social activity, occupation, sexual behavior, self-care, and life-support activities (Belkadi, Benchehida, Benbernou, & Sebbane, 2019) are reported in Table 1.

Table 1. Patient characteristic

Participants (N=83)						
	Adapted physical activity group (n=43)			Control group (n=40)		p
	Mean ± SD			Mean ± SD		
Age (year)	42,18±13,17			47,07±13,87		0.07
Height, cm	164.0±5.47			166.0±5.2		0,09
Weight, kg	86.0±9.56			82.0±6.34		0,06
Body mass index	28.74±4.62			27.36±5,13		0.51
	N	%	Sex	N	%	
Male	28	65,11		23	57,5	0.84
Female	15	34,88		17	42,5	
Level of education						
Primary school	17	39,53		13	32,5	0.45
Secondary school	15	34,88		17	42,5	
Higher education	11	25,58		10	25	
Profession						
No worker	12	27,9		18	45	0.08
worker	31	72,08		22	55	

All patients were evaluated by a single physician. The study protocol was approved by the local Ethics Committee. A written informed consent was obtained from each patient.

Inclusion criteria: Low back pain for more than 3 months, Diagnosis of chronic low back pain by specialist physician, No drug use, Active in daily life, Literate, 19-63years old, Volunteer to participate in the study.

Exclusion criteria: Spine fracture or dislocation, Patients with severe osteoporosis, Those with malignancy, Patients with inflammatory low back pain, Patients who have had spine or disc surgery, The study was conducted in accordance with the principles of the Declaration of Helsinki.

Exercise program

Active isotonic and isometric strengthening exercises were prescribed to strengthen the frontal abdominal muscles (musculus obliquus externus abdominis, musculus obliquus internus abdominis, musculus rectus abdominis), deep abdominal muscles (musculus psoas major, musculus psoas minor, musculus iliacus, musculus quadratum lumborum), and back muscles (musculi dorsi, musculus erector spinae, musculi transverso-spinales, musculi inter-spinales, musculi intertransversarii). For the hamstrings, lumbar extensors, and hip flexors, a set of stretching exercises was specified. A Hospital-based exercise protocol was instructed by the physiotherapist to each patient. In addition, a written exercise program was given to the patients. The exercise program lasted for twelve weeks and was performed at least three days per week, three exercises per day, with each exercise repeated at least 4 (series *10 repetition).

Statistical Analysis

Statistical analysis was performed using the using SPSS software (version 22) and Significance levels were set at $p \leq 0.05$. Shapiro- Wilk test was used to evaluate normal distribution of the conformity of continuous variables. To evaluate the differences among the categorical variables (level education, gender and profession) between the groups, the chi-square test was performed. The t-test for normally distributed variables. The repeated measures analysis of variance (ANOVA) was performed to compare the data from the parameters constantly measured in the intra-group analysis. To detect the sub-group differences, the Bonferroni Student t-test was used. A p value of <0.05 was considered statistically significant.

3. Results and Discussions

Table 2. *Intra- and inter-group comparisons of results before, at four weeks, eight weeks, and 12 weeks after treatment on VAS: Visual Analog Scale*

	Adapted physical activity group (n=43)		Control group (n=40)		Inter-group	
	Mean	SD	Mean	SD	p	F
VAS baseline	7,03	0,46	6,13	0,54		7.071
VAS 4th week	5,23	0,47	4,93	0,56	0,033	
VAS 8th week	5,33	0,47	5,13	0,57	0,013	
VAS 12st week	5,63	0,56	5,93	0,56	0,008	

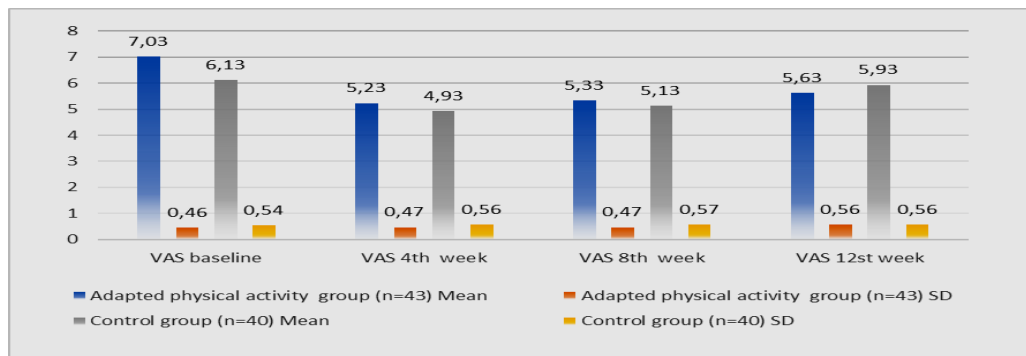


Figure 1. Mean and Standard deviation comparisons of results before, at four weeks, eight weeks, and 12 weeks after treatment VAS: Visual Analog Scale

Table 3. Intra- and inter-group comparisons of results before, at four weeks, eight weeks, and 12 weeks after treatment ODI: Oswestry Disability Index

	Adapted physical activity group (n=43)		Control group (n=40)		Inter-group	
	Mean	SD	Mean	SD	p	F
ODI baseline	52,03	0,32	45,84	1,3		6,69
ODI 4th week	45,03	0,92	33,94	2,3	0,022	
ODI 8th week	45,13	1,02	34,44	2,1	0,012	
ODI 12th week	48,03	1,42	45,94	1,5	0,013	

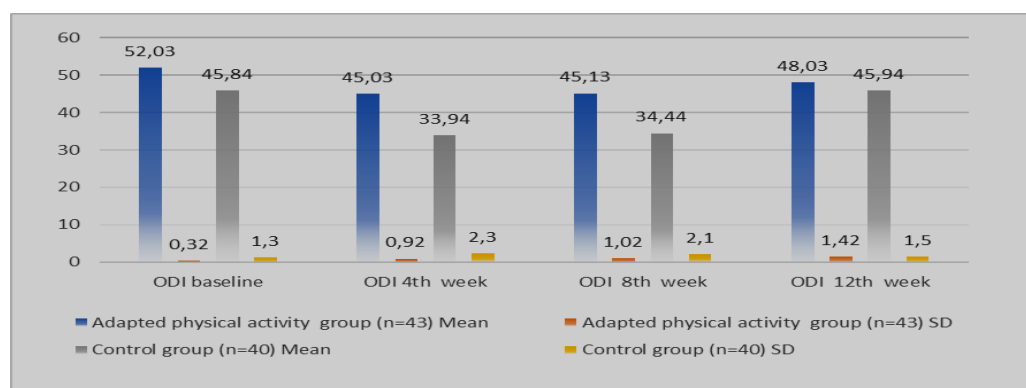


Figure 2. mean and Standard deviation comparisons of results before, at four weeks, eight weeks, and 12 weeks after treatment ODI: Oswestry Disability Index

Table 4. *Intra- and inter-group comparisons of results before, at four weeks, eight weeks, and 12 weeks after treatment LBP: Low Back Pain Disability Index*

	Adapted physical activity group (n=43)		Control group (n=40)		Inter-group	
	Mean	SD	Mean	SD	p	F
LBP baseline	32,13	1,12	24,64	2		9,615
LBP 4th week	23,13	0,82	15,54	1,8	0,038	
LBP 8th week	24,03	1,02	17,44	1,6	0,017	
LBP 12th week	26,73	1,32	22,64	1,9	0,001	

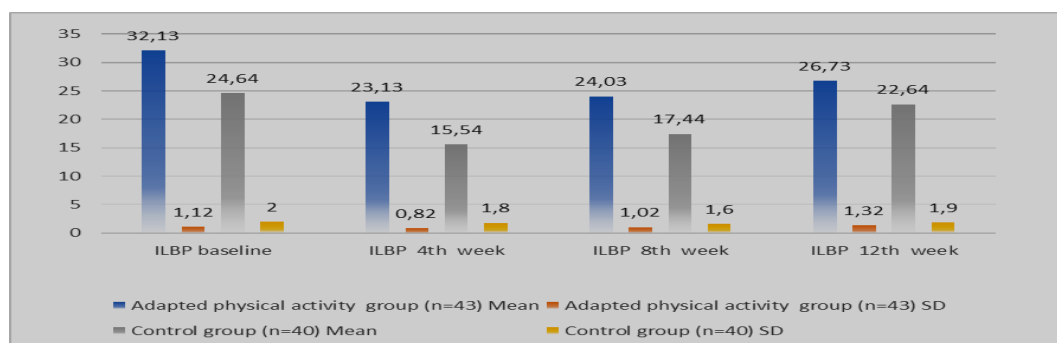


Figure 3. *mean and Standard deviation comparisons of results before, at four weeks, eight weeks, and 12 weeks after treatment LBP: Low Back Pain Disability Index*

There was a statistically significant difference in the Visual Analog Scale (VAS), Oswestry Disability Index ODI, and Low Back Pain Disability Index (LBP) scores, at four weeks, eight weeks, and 12 weeks after treatment of follow-up, compared to the baseline values between the groups, in favor of (EG) (Table 2,3 and 4).

Discussions

This study set out with the aim of assessing the effects adapted physical activity (APA) protocol to improve pain and functional capacity through structured adapted exercises to muscular capacity on patients in a Functional Restoration program. In this randomized controlled trial, we found that combining physiotherapy methods with adapted physical activity and medical treatment for indeterminate low back pain improved pain and functional status compared to physiotherapy without adapted physical activity treatment. This improvement lasted 6 weeks after treatment. These results show that physiotherapy combined with adapted physical activity leads to better improvements in pain and functional status 12 weeks after the start of treatment.

The main goals of low back pain treatment are to reduce pain, improve soft tissue resilience due to spasticity and tension, increase the strength and endurance of trunk stabilizers, improve mobility and posture, and thus, improve functional

ability, improve the ability to perform activities of daily living and prevent loss of work. (Alamam et al., 2019; Smeets, Hijdra, Kester, Hitters, & Knottnerus, 2006; yassin zenati et al., 2021) Various methods such as rest, medical treatment, back to school, exercise programs, physiotherapy methods, and manipulation are used in the treatment of low back pain (Adel et al., 2019; Shipton, 2018). The multidisciplinary approach has proven to be more effective than a single method of treatment. (Berardi et al., 2020; Moradi et al., 2012; Shipton, 2018) Therefore, a multidisciplinary approach including physical therapy, exercise and medical therapy was applied in our study.

A decrease in the strength and endurance of the muscles of the spine are important risk factors for developing lower back pain (Gordon & Bloxham, 2016; Lee & Kang, 2016). In addition, the strength of the muscles of the body is weaker in patients with low back pain than in healthy people (de Sousa et al., 2019; Hodges & Danneels, 2019; Suh, Kim, Jung, Ko, & Ryu, 2019). In patients with reduced muscle tone, the risk of developing low back pain is three times higher. Therefore, exercise is one of the main modalities in the treatment of nonspecific low back pain. It aims to improve posture, strengthen core muscles and increase aerobic capacity, which results in reduced pain and improved functional status (Adel, Alia, & Mohammed, 2020; Beboucha, Belkadi, Benchehida, & Bengoua, 2021).

In one study, Hendrick et al. (Hendrick et al., 2010) Exercises for lower back pain have been reported to be effective in speeding up improvement in activities of daily living and return to work. In a meta-analysis (Gordon & Bloxham, 2016), patients with low back pain who were treated with exercise therapy showed significant improvement in pain and functional status (Belkadi, 2019; Belkadi et al., 2015; Benhammou, Mouro, Mokkedes, Bengoua, & Belkadi, 2021), compared to the patients who received no treatment or other conservative treatments (Moradi et al., 2012).

Inactivity has also been shown to lead to undesirable behaviors such as kinesophobia, anxiety, and difficulty coping with pain, and exercise therapy reduces these behaviors (Klaber Moffett, Carr, & Howarth, 2004). However, there is no specific information regarding the effect of types of exercise (i.e., flexion, stretching, or strengthening) on patient outcomes (Mohammed, Bachir, Eddine, & Adel, 2018). In several studies, it has been shown that pain relief due to exercise therapy in low back pain is limited to six months (Searle, Spink, Ho, & Chuter, 2015). In our study, isometric lumbar, lumbar and hamstring stretching exercises were applied. Both pain and functional status improved with Adapted physical Activity, exercise therapy, and medical treatment prescribed in this study. We also observed that this improvement lasted for 12 weeks.

Many studies on patients with CLBP (Foster et al., 2018; Heidari et al., 2018; Steffens et al., 2016, 2016), we concluded that pain and functional status were negatively affected; therefore, the treatment was effective in improving pain severity and functional status. (Maughan & Lewis, 2010; Namnaqani, Mashabi, Yaseen, & Alshehri, 2019; van Middelkoop et al., 2010) In the present study, the VAS was used to assess pain severity and the ODI and ILBP were used to assess functional status. We found significantly higher improvements in VAS, ODI, and

ILBP scores with the addition of adapted physical activity at four weeks eight weeks and one 12 weeks of follow-up, compared with medical and physiotherapy program alone.

Another method used in the treatment of patients with nonspecific CLBP, which we also included in this study, is Adapted physical activity modalities. These modalities provide short-term treatment, including cold application, hot pack, ultrasound, diathermy, and TENS (Becker et al., 2012; Koes et al., 2010; Lizier, Perez, & Sakata, 2012; van Middelkoop et al., 2010). These treatments are noninvasive, safe, easy to administer, and rarely cause significant side effects, except for mild skin irritation. (Becker et al., 2012; Jensen, Jensen, Riis, & Petersen, 2016) In several studies, Adapted physical Activity has been shown to be more effective than placebo. (Bialosky, Bishop, George, & Robinson, 2011; Howick et al., 2013; Li & Bombardier, 2001; McIntosh & Hall, 2011). One of the most commonly used physical therapy methods is TENS. In one study, TENS was found to be more effective in reducing pain and increasing joint range of motion compared to placebo (Howick et al., 2013). Marchand et al. (Marchand et al., 1993) divided 48 patients with low back pain into three groups as control, placebo and TENS. A 43% reduction in pain severity was found in the TENS group. (Marchand et al., 1993) In another study evaluating hot and cold applications, hot application was shown to be more effective than placebo in reducing pain in patients with acute and subacute low back pain (Petering & Webb, 2011), and cold application controlled pain in the acute phase and reduced muscle tension (Dehghan & Farahbod, 2014; Mokhtar et al., 2019)

In our study, there was no placebo group. We found that when added to medical treatment and exercise, Adapted physical Activity was associated with greater improvement in pain and functional status. Although the effectiveness of these treatment modalities was not evaluated separately in our study, the positive effect of adding adapted physical activity to the other treatment modalities was demonstrated. In many studies, the treatment groups for CLBP are heterogeneous, no control group is included, and the effectiveness of the treatment is only evaluated for a short period of time (Bai et al., 2019; White, Arnold, Norvell, Ecker, & Fehlings, 2011). In our study, the treatment groups were homogeneous and a control group was included. Follow-up was continued for 12 weeks. It is essential that the effect of treatment for low back pain is long-term; therefore, maintenance of pain control and functional improvements must be maintained. Isokinetic measurements are the gold standard for demonstrating exercise efficacy, but they are highly subjective. In our study, we did not perform isokinetic muscle strength measurements; this may represent a limitation. Another limitation is the unknown contribution of medical and exercise therapies to patient improvement from their hospital therapy. The ideal control group for this study would be a group of patients who would be followed up without any second treatment. Regardless of our intervention towards the experimental group, because this would be unethical, we provided our intervention through follow-up and rehabilitation through the program only for the benefit of the experimental group of patients.

4. Conclusions

In conclusion, treatment approaches for chronic conditions should have long-term effects and should ideally provide permanent improvement. The results of our study showed that improvements could be maintained for 12 weeks with 3 sessions of APA after treatment. Therefore, combined treatment with exercise, medical therapy, and adapted physical activity was more effective for specific low back pain than physiotherapy program alone. These results suggest that treatment of low back pain should ideally include a multidisciplinary approach with Adapted physical Activity to provide long-term improvement.

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