Benefits of Physical Activity for Low Back Pain Across Different Age Groups

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Abstract

Low back pain (LBP) is one of the most common and incapacitating pain conditions globally. Its current treatment is essentially pharmacological, leading to a large consumption of painkillers and opioids. The present non-systematic review collects data from various clinical trials evaluating the effects of physical activity in low back pain management and organizes them into different age groups. Early treatment in adolescents based on physical activity combined with spinal manipulative therapy shows a decrease in chronic low back pain. In adults, various combination therapies have been reviewed with mixed results. Lumbar stimulation combined with activities such as walking has been found to be the most significant one. Physical activity shows great benefits in the elderly population, because it reduces the intake of painkillers. These findings stress the value of exercise as an alternative to pharmacological treatment in low back pain management.

Keywords: low back pain, physical activity, adolescents, adults, elderly.

1. Introduction

Low back pain (LBP) affects the lumbar region of the spine. Though it can range in intensity, LBP is considered to be one of the most common pain conditions, with an estimated 40 to 80% of individuals worldwide experiencing it at some point in their lives (1, 2). In the past two decades, there has been a 42% increase in limitations due to LBP, thereby establishing itself as the first cause of disability worldwide (3).

The high prevalence of LBP and its association to disability and deterioration in quality of life make it a public health issue (4). It imposes a high cost on society, with sick leaves due to LBP showing a similar incidence to leaves due to pathologies such as diabetes mellitus or coronary heart disease (5).

There are various forms of LBP, such as mechanical low back pain, which affects spine, joints, and muscles (6), and non-specific low back pain, which is not attributable to a known cause (7). Figure 1 illustrates both types of pathologies.

The role of cognitive and behavioral factors in the development and management of chronic pain has recently been emphasised. Chronic pain causes a cortical reorganization which sensitises the neural network that subserves pain and disinhibites the surrounding neural networks. Thus, the modification of pain-eliciting and maintaining behaviors, cognitions and emotions has the potential to increase pain management and tolerance (8). Furthermore, physical activity and exercise can have an effect on these neural networks, which leads to a decrease in chronic pain (9).

In collecting the findings of various clinical trials, the present narrative review aims to examine the benefits of physical activity to reduce LBP, stratified by age.

2. Adolescents

Low back pain most often begins in adolescence (10-12), which is considered a strong predictor for LBP in adulthood. Adult pain levels appear to be reached by around the age of 18 (13-15). Rehabilitation exercises should be fostered in order to help patients manage LBP and prevent future relapses (16). Similarly, spinal manipulative therapy (SMT) combined with exercise therapy (ET) is advised before pharmacological treatment, as it has proven to be effective for low back pain (17). Encouraging patients to remain active is also key in LBP treatment in order to prevent long-term sitting, which is known to exacerbate symptoms (18). Aerobic exercise is the most recommended activity to this end (19). Few studies documenting the effectiveness of physical exercise for LBP have been conducted on children and adolescents (20-22).

In a randomized trial with a sample of 185 adolescents aged 12-18 years, the effectiveness of spinal manipulative therapy combined with exercise therapy was compared to exercise therapy alone. The first option involved spinal manipulation and mobilization, while the second required the teaching and supervision of exercises by trained personnel, as well as the unsupervised performance of the same exercises at home. Participants were provided with instructions on how to perform the physical exercises and which posture to adopt while exercising, sitting down, studying, etc. Spinal manipulation combined with exercise for over 6 months reported an increase in the functional capacity of the individuals, as shown in Graph 1. Both approaches led participants to experience a long-term decrease in LBP intensity. It is also noteworthy that adolescents reported an 80% reduction in medication use. These are important findings in light of the concern that exists around the safety and effectiveness of medication use for managing LBP (23).

One of the most common forms of LBP in adolescents is directly linked to the exercises in elite gymnastics which overstrain the lumbar spine (24). A clinical trial was conducted on a 15-year-old female gymnast with extension-based LBP. The movements overloading her lumbar spine were reeducated thanks to specific activities using a spine stabilizer and manual therapy technique. It was found that the addressing of cognitive-affective factors together with the correction of maladaptive exercises reduced the nociceptive input and desensitized the nervous system, leading to a better control of LBP (25). Another clinical trial developed a programme of exercises designed to help prevent low back injuries and reduce pain. Thirty female athletes, 10-14 years old, participated in this study. Fifteen gymnasts implemented back stretches and various exercises to improve posture and coordination in their ordinary training, while the other fifteen followed the standard training, acting as the control group. After the intervention, assessment showed a decrease of pain identified as mild (12%) or moderate (11%) and a disappearance of severe pain (26).

3. Adults

Clinical prediction rules analyse the feasible evolution of patients with LBP without surgical intervention (27). PERRON et al. carried out a study during a month and a half with 85 soldiers suffering from subacute or chronic low back pain and without surgical intervention. This study showed that there are a series of variables which can predict the future evolution of patients before the physical activity is performed. These variables are included in Table 1. Of the subjects who presented between four and five variables, 77.5% obtained a favorable outcome (28). The purpose of the authors was to establish a new clinical prediction rule that would help identify the prognosis of these patients depending on the variables considered in the study.

3.1. Conventional exercises

On the one hand, the aim of lumbar stabilization exercises (SE) is to strengthen the muscles in charge of stabilizing the spine (29). These exercises should be adapted to the clinical characteristics of each patient (30), which can be done by using individualised graded lumbar SE (IGLSE), since this technique permits to adapt the intensity of the exercise. HYUN SUH et al. carried out a prospective, randomized, controlled study in order to evaluate walking efficiency (WE) and put into practice IGLSE with a sample of 48 patients with LBP. The study showed that lumbar SE and WE significantly improved LBP (31).

On the other hand, promotion of physical activity is essential for a good development and for its practice (32). The Movement Coaching is an intervention which comprises three different components, (33) such as physical exercise in the same place and time with a therapist, which is very effective (34), and also includes telephone and internet-based aftercare. SCHALLER et al. performed a randomized controlled trial in Germany with 144 patients with LBP. The sample was divided into two groups of 71 and 73 patients respectively and they compared a multicomponent intervention with Movement Coaching and a control intervention with online presentations without coaching. Their results were not significantly relevant and they did not prove that the suggested therapy was more effective. This could be due to a decrease in the total physical activity during the 12-months follow-up (33).

In addition, home exercise programmes have also been developed. These consist of 10 minutes of aerobic activity followed by eight types of ground exercises, which were aimed at strengthening the lumbar muscles, and five types of muscle stretches (35). These interventions, which appear in Figure 2, were carried out by two groups of 13 and 17 patients with LBP respectively. Only the first group was supervised by a physical therapist each week. Both groups experienced a symptomatic improvement in LBP, but the differences between the supervised and the unsupervised group were not significant (35).

3.2. Balneotherapy

The combined therapy of physical exercise and balneotherapy was approached in order to allow workers with this chronic LBP to return to work. For

this purpose, a prospective randomized controlled trial was performed (36) using a modified Zelen design (37). This was carried out with a sample of 88 patients in France. The patients were divided into two parallel groups of 45 and 43 subjects respectively. The first group received a 5-day intensive intervention, which consisted of balneotherapy (2 hr/day), physical exercise (45 min/day) and an individualized educational program (45 min/day). On the contrary, the second group was taken as a control group and only received regular medical supervision. The findings were promising, but there was no significant evidence because the size of the sample was insufficient (36). These results leave the door open for future clinical trials in this area.

On the other hand, HUBER et al. carried out a randomized controlled trial with 80 Austrian patients. They were divided into three groups: the first group (27 patients) performed green exercise, the second one (26 patients) combined green exercise with balneotherapy, and the third one (27 patients) was the control group and did not spend 8 days in the Tyrol. With the second group, mountain hiking and a spa treatment with Mg-Ca-SO4 thermal water were used in order to evaluate the symptomatic improvement and the spinal mobility. The results of the study showed that this combined therapy has benefits for the participants concerning pain, functional mobility and subjective quality of life (38).

3.3. Alternative Therapies

Tai Chi (TC) is a health-promoting exercise (39) that can be performed by people from different age groups (40). In addition, it shows benefits in multiple pathologies (41). It aims to integrate mind-body development to improve or maintain the health state (42). A randomized controlled trial was conducted on 43 patients with LBP to learn about the effectiveness of TC. They were divided into three groups, the first one of 15 people who were treated with TC exercises; the second one of 15 patients who performed core stabilization exercises; and the last group of 13 patients who were taken as control group (43). The results showed that TC had positive effects on pain, but did not improve the proprioception on lower limbs, which were also assessed.

Likewise, yoga is another alternative therapy that seeks to alleviate the symptoms and pain of multiple conditions (44). NEYAZ et al. conducted a prospective randomized comparative study to determine whether Hatha yoga (HY) therapy was more effective than conventional therapeutic exercises (CTEs) in patients with chronic low back pain. The Hatha yoga intervention includes a series of physical, breathing and meditation exercises. The sample size was of 70 subjects, distributed in two equal groups that were treated with both techniques. The Hatha yoga therapy consisted of six sessions (35 min/week). Pain intensity decreased significantly in both groups with no evidence of improvement in one group over the other (45).

4. Elderly

The world's population is aging rapidly and it is estimated that between 76 and 82% of elderly patients suffer from some form of non-cancer pain (46, 47). LBP is common in older adults, resulting in physical limitations, disability, and decreased quality of life. The prevalence of this form of pain is estimated to affect between 32 and 58% of the elderly population (48, 49). Many of them are undergoing opioid and analgesic treatment in order to manage their chronic pain. This highlights the need to identify other safe non-pharmacological strategies for pain management in the elderly. Some studies have shown the advantages of physical exercise or spinal manipulative therapy to manage LBP (50, 51). Promoting pain management programs to learn how to manage pain in the long term has also been found to be effective (52).

A randomised clinical trial conducted on 241 people over 65 years old with LBP assessed the benefits of adding spinal manipulative therapy or supervised rehabilitation exercises to the exercise performed at home for 12 weeks. Three groups were created for this purpose. The first group exercised only at home, the second combined it with a supervised exercise program and the third with spinal manipulative therapy. The reduction of pain intensity was not very significant in the combined therapy of spinal manipulation and home exercise compared to physical exercise alone, increasing the improvement by only 10% as shown in Graph 2. It was considered more cost-effective to develop a multi-session home exercise program and in patients requiring more support to perform spinal manipulative therapy or supervised exercise (53).

Another randomized clinical trial was conducted with 60 seniors in their 70s. Home strengthening, stretching and aerobic activity interventions were performed and followed up by telephone. It was concluded that this method was effective and valid to increase adherence to exercise programs in older patients with LBP (54).

New approaches to LBP treatments include promoting healthy habits and techniques for pain management, and reducing interventions to treat pain symptoms by reducing the high consumption of medications and medical interventions (55). Physical exercise is a simple activity that can be performed at home (56). Using telecommunication for pa-

tient follow-up is a novel approach in medicine that has advantages for older patients as they can access health care comfortably from home (57).

5. Conclusion

Several clinical trials have shown the benefits of physical activity in reducing LBP. Spinal manipulation, along with the development of physical exercise has been found to relieve low back pain in adolescents. In addition, in this age group, preventive compensatory training has also been identified as relieving pain in elite gymnasts in the short term. Various combination therapies have been reviewed for the adult population. Balneotherapy, alternative therapies such as Tai Chi or Hatha Yoga, or spinal stimulation have been highlighted; all of them accompanied by physical exercise. Spinal manipulation has shown a more relevant symptomatic improvement. Regarding the elderly population, the improvement is not as significant in terms of intensity. However, it favors the decrease of painkiller intake and pain management by the patient. Furthermore, in this age group, telephone follow-up increased adherence to treatment, unlike other age groups.

This review suggests that physical exercise helps to lower LBP. In both adolescents and adults, it would be advisable to practice physical exercise along with other therapies to achieve a more significant pain relief. Moreover, telephone follow-up is recommended in the elderly to influence the monitoring of suggested physical activities.

However, there is still not enough evidence available, so more clinical trials on LBP and exercise can be suggested in all age groups. This limitation is present mainly in adolescents, so studies regarding this age range could increase the scientific evidence in this field.

Statements

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Ethical concerns

This paper did not require the approval of any ethics committee.

Conflicts of interest

The authors of this paper declare no conflicts of interest.

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Annex I: Figures

Figure 1. Cases of low back pain (LBP).

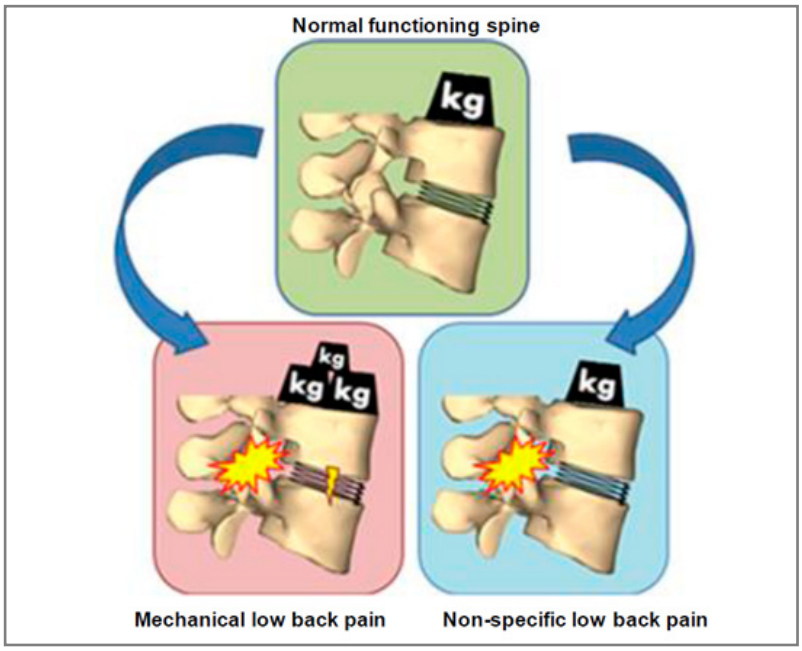
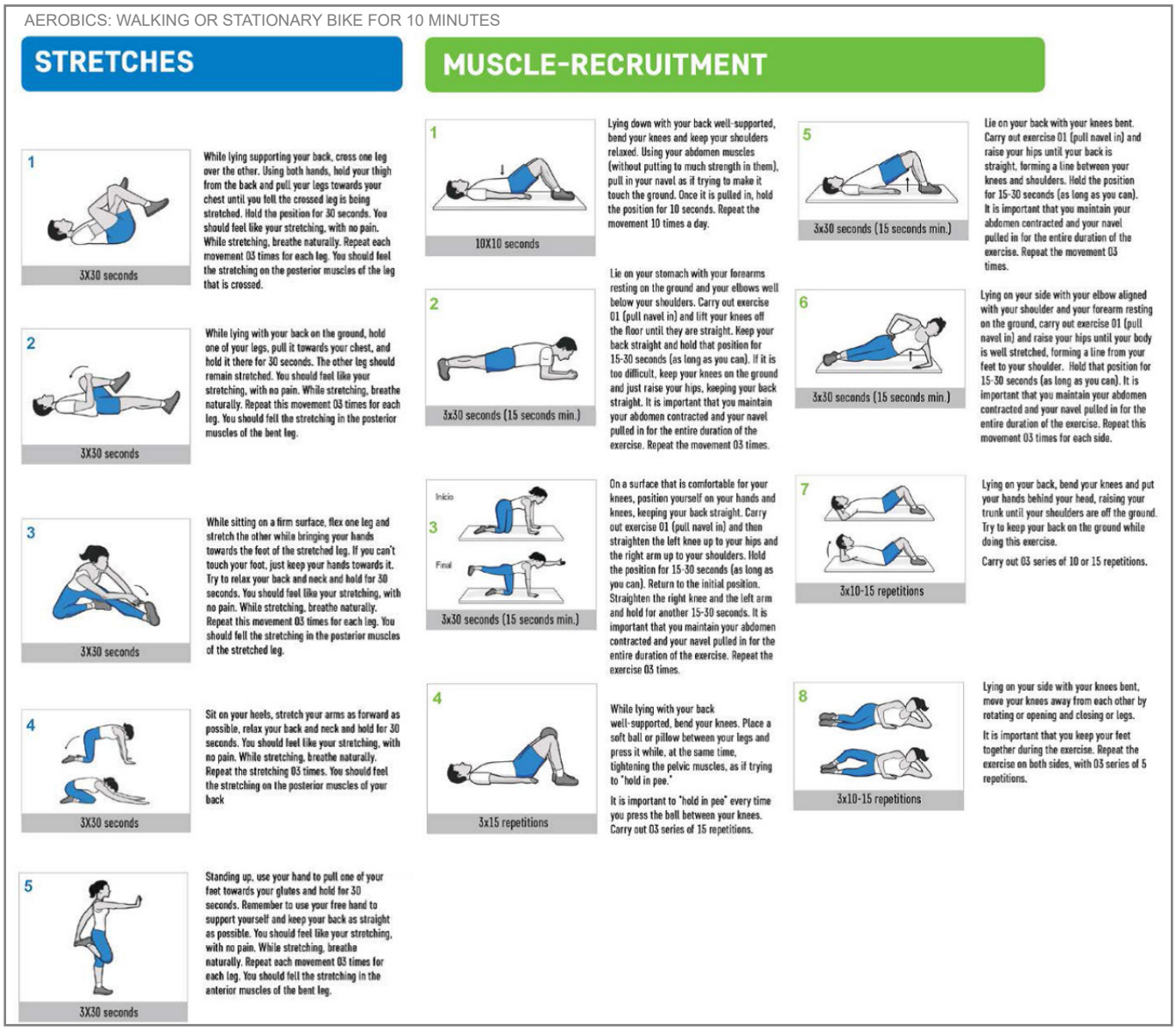
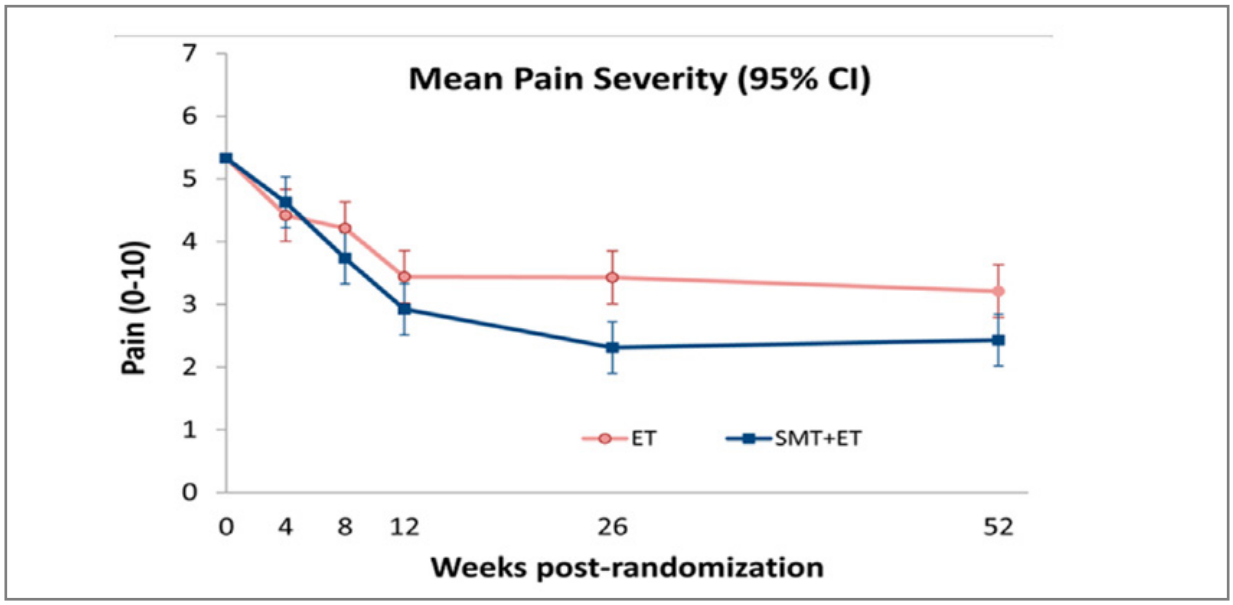


Figure 2. Table showing the exercise program to be developed at home, for stregth and stretching.
Image adapted from Kanas M et al. (35)

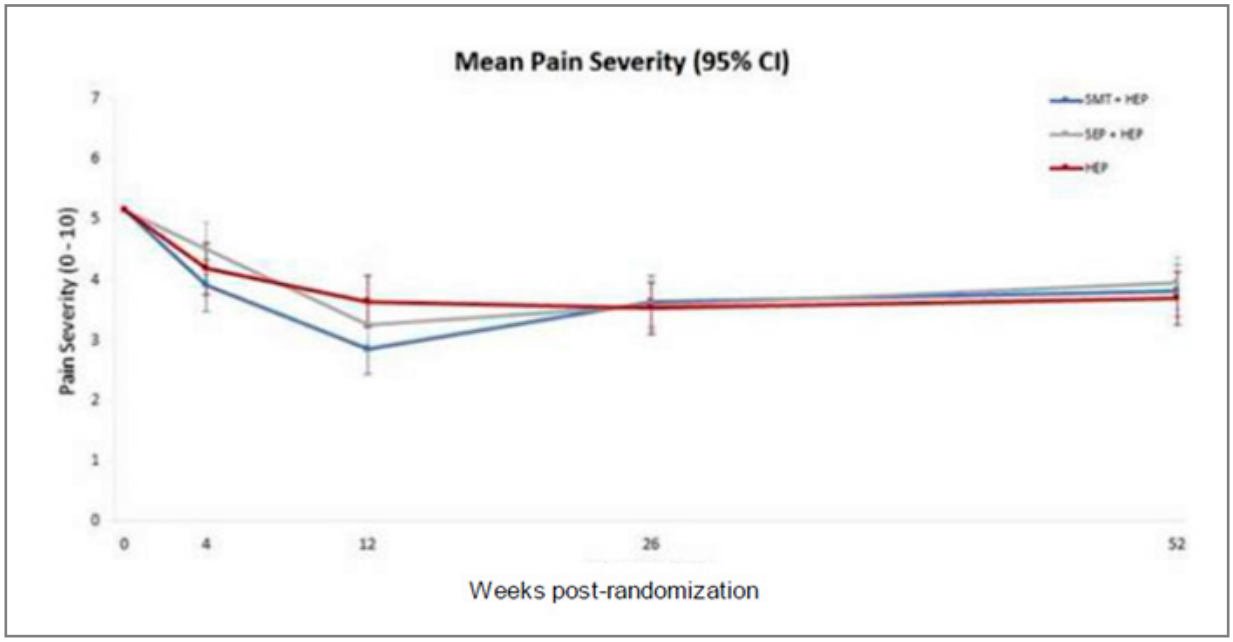


Annex II: Graphs

Graph 1. This graph sows the change in mean pain severity over time in the group that performed only exercise therapy (ET) and in the group that combined it with spinal manipulative therapy (SMT+ET). Adapted from Evans R et al.



Graph 2. This graph shows the change in mean pain severity over time for the group with a home exercise program (HEP, in red), the group which combined a home exercise program with supervised exercise program (SEP+HEP, in grey) and another group which combined a home exercise program with spinal manipulative therapy (SMT+HEP, in blue). Adapted from Schulz C et al. (53)



Annex III: Tables

Table 1. The FABQ Work consists of a Fear-Avoidance Beliefs Questionnarie.
Number in square brackets represent the 95% confidence interval. Adapted from Perron M et al. (28)

Variables	Sig.	Sensitivity	Specificity	LR+	LR-	Odd Ratio
No pain in lying down	0.017	0.75 [0.58-0.87]	0.49 [0.34-0.64]	1.47 [1.05-2.06]	0.51 [0.29-0.92]	3.65 [1.3-10.6]
No use of antidepressants	0.061	0.95 [0.82-0.99]	0.24 [0.13-0.40]	1.26 [1.05-1.51]	0.20 [0.05-0.90]	5.2 [0.9-29.4]
FABQ Work <22.5	0.061	0.73 [0.56-0.85]	0.67 [0.51-0.80]	2.18 [1.38-3.43]	0.41 [0.24-0.70]	2.9 [0.9-8.6]
Number of previous treatments <5	0.144	0.68 [0.51-0.81]	0.58 [0.42-0.72]	1.60 [1.07-2.39]	0.56 [0.35-0.91]	2.2 [0.8-6.3]
Work restriction <6 months	0.161	0.85 [0.69-0.94]	0.44 [0.30-0.60]	1.53 [1.14-2.05]	0.34 [0.15-0.75]	2.48 [0.7-8.8]