

THESIS REVIEW

Smeets RJEM. *Active Rehabilitation for Chronic Low Back Pain: Cognitive-Behavioral, Physical, or Both?*
PhD Thesis.

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Low back pain (LBP) presents a large challenge to the healthcare system despite improving scientific technology, medical insight, and suggested management strategies¹. Greater insight has been gained on what not to do with patients with LBP rather than what to do for them². When LBP lasts longer than 3 months it is classified as chronic low back pain (CLBP)³. Research has unsuccessfully emphasized biomedical approaches in managing this dilemma while neglecting the psychosocial impact of LBP and its contribution to functional limitation, disability, and overall decreased quality of life. The current available research, while dealing with both the physical and mental aspects of LBP, has fallen short of conclusive findings to assist healthcare providers in gaining the upper hand on this dilemma. Insufficient sample sizes, methodological errors, or both have resulted in inconclusive findings regarding the optimal management strategy for CLBP. In his dissertation, Dr. Smeets seeks to improve the methodology of research investigating the issue of optimal management and gain insight into the benefits, or lack thereof, of rehabilitation involving physical approaches, cognitive-behavioral approaches, or a combination of both in the management of CLBP. His work challenges generally held assumptions with regard to rehabilitation with surprising research conclusions shaking the foundation of seemingly logical management strategies for the CLBP population.

The development of CLPB has been based on three models; the physical deconditioning model, the cognitive-behavioral model, and the biopsychosocial model which is a combination of the physical deconditioning model and the cognitive behavioral model. Matching rehabilitation interventions have been based on the biomedical model, cognitive-behavioral model, and a combination of biomedical and cognitive-behavioral models, respectively. Unfortunately, current research does not give a clear picture of the effectiveness of these rehabilitation models. As a result of poor methodology confounding specific conclusions, more questions with regard to the effectiveness of rehabilitation for CLBP remain. Smeets concludes chapter 1 by outlining the goal of his thesis.

There is circumstantial evidence to suggest that the social and personal context of the individual influences, at the very least, the medical presentation of LBP in addition to the extent of the individual's activity limitations. It is further postulated that persistent LBP leads to avoidance of physical activity, which leads to further deconditioning (cardiovascular and paraspinal muscle endurance) and increased LBP. Since the 1980's this postulated phenomenon has been referred to as the "deconditioning syndrome". Chapter 2⁴ seeks to investigate the "deconditioning phenomenon" by performing a review of the current literature investigating the features of: 1) physical deconditioning in LBP pertaining specifically to cardiovascular fitness and the loss of paraspinal muscle strength, and 2) which treatments are effective in addressing these cardiovascular and paraspinal muscle strength impairments. The results of the review are somewhat surprising. There was a noted lack of strong evidence supporting the existence of the physical "deconditioning syndrome", specifically, decreased cardiovascular fitness and paraspinal muscle weakness in individuals with CLBP. The evidence for paraspinal multifidus muscle atrophy in individuals with CLBP was limited. No strong evidence was found favoring intense physical training programs over other active therapies. Despite this lack of support for physical deconditioning, patients and healthcare providers continue to latch on to the biomedical model for which physical deconditioning appears to be a favorable explanation for continued persistent LBP. In concluding, more research involving longitudinal study designs are needed to investigate these issues. Furthermore, greater care should be taken by the healthcare professional when describing deconditioning and CLBP in disability.

Current rehabilitation strategies are primarily based on the assumption that patients with CLBP have low levels of aerobic fitness and are deconditioned (i.e., physical deconditioning syndrome). What is not clear is if aerobic deconditioning exists in CLBP. In Chapter 3⁵, Smeets conducts a prospective case series to investigate the hypothesis that patients with CLBP have decreased aerobic levels when individual results are adjusted for age, gender, and level of sport activity when compared to healthy controls. Specifically, if there is a difference in aerobic levels, is it associ-

ated with pain intensity, duration and degree of disability, fear of injury, level of activities at work, household, and leisure? 108 subjects underwent an Astrand bicycle test to assess maximal oxygen consumption. These results were compared to a database of 18,082 healthy subjects and matched and adjusted accordingly. The results revealed that individuals with CLBP had significantly decreased aerobic fitness when matched to controls. 86% had lower observed than expected maximal oxygen consumption (VO_{2max}) values. Unfortunately, despite these results, no satisfactory explanation could be postulated with regard to this data. Additionally, there was no proof of the existence of the fear-avoidance model of pain. However, there was evidence of an association between lower levels of aerobic fitness and CLBP, but not support of an association with fear of injury, pain, lower fitness levels, duration, or severity of disability.

There is a trend in the current body of evidence suggesting the combination of strengthening with aerobic exercise, in addition to a cognitive-behavioral approach, is useful in the management of CLBP when compared to no treatment or wait-list control. However, this evidence is limited in its applicability, as this combination of treatments has not been tested against other active therapies. Furthermore, studies have exhibited a crossover between the various proposed intervention models limiting the ability to determine if one approach is better than the other. In Chapter 4⁶, Smeets designs a randomized controlled study (RCT) to immediately investigate the results of intervention strategies reflective of the deconditioning model (physical treatment-APT), the cognitive-behavioral model (cognitive-behavioral treatment-CBT), and the biopsychosocial model (combination of physical and cognitive-behavioral treatment-CT). Thus this study would avoid any potential crossover by exclusively testing each model. In this study, 223 subjects were analyzed using the intention-to-treat analysis. The results revealed that all models were more effective than the wait-list control. The APT and CBT were as effective as CT in reducing the personal experienced level of functioning. The CBT is preferred when the patient is moderately to severely functionally limited.

The immediate post-treatment results from the RCT conducted in Chapter 4⁶ revealed treatment effectiveness greater than the wait-list control of all three treatment interventions (APT, CBT, and CT). Additionally, the combination treatment (CT) was no more effective than either single intervention (APT and CBT). In Chapter 5⁷, Smeets investigates the results of the RCT at 6–12 months post-treatment. Data was collected from the subjects (wait-list and active treatment) reported on in Chapter 4⁶ at baseline, immediately post-treatment, and at 6–12 months post-treatment (active treatment only). The follow-up for the active treatment groups at 12 months was 156 out of 172 patients. Again, CT was not more effective than APT or CBT approaches. These results suggest that CT may not be as useful a treatment option secondary to the higher burden to patients. Thus the conclusion is that at one-year follow-up, single treatments (APT and CBT) are equally effective as the combined treatment (CT). Smeets suggests that the future research may investigate identifying subgroups of patients who may respond more optimally to one of the specific treatment options.

In the management of CLBP, current evidence suggests that exercise therapy, cognitive behavioral therapy, and multidisciplinary therapy are more effective than doing nothing or watchful waiting. Currently there is no strong evidence that one is more effective than the other. Pain catastrophizing has been shown to affect the outcomes of multidisciplinary studies. Currently, no studies have evaluated the mediating role (i.e., how does the treatment work) of pain catastrophizing and internal control in pure physical treatment for CLBP. Understanding the mediating role of pain catastrophizing may help facilitate the development of more effective treatments. The purpose of this RCT, described in Chapter 6⁸, was to evaluate whether or not pain catastrophizing or internal control affected the outcome, in terms of pain, depression, and functional disability in patients with CLBP who received active therapy (APT), cognitive-behavioral therapy (CBT), or a combination of both (CT) as compared to a wait-list control treatment group. Data from 211 subjects was gathered and analyzed. All analyses were completed with an intention-to-treat analysis. The basic hypothesis tested was that some form of treatment (APT, CBT, or CT) was better than nothing (wait-list-WL) at all. Additionally, it was proposed that the combination of single treatments (CT) was better than single treatments (APT and CBT). All subjects underwent their respective treatment for 10 weeks total. Pain catastrophizing decreased in all 3 treatment categories when compared to WL. Internal control of pain, unexpectedly, did not change for all 3 treatment categories and, therefore, could not be considered a mediating factor. All further analyses for internal control were stopped. All 3 interventions were equally effective in reducing disability, patient-specific complaints, and current pain. APT was the only intervention group that significantly reduced depression scores. This is the first study in which a physical treatment intervention appears to have been mediated by a decrease in pain catastrophizing. This is theorized to occur by letting patients experience activities in a controlled environment that would normally negatively affect their symptoms when performed in an uncontrolled environment while at the same time substantially positively influencing cognitive change.

Patient's initial beliefs regarding the success of a given treatment have been shown to affect the final outcome of the treatment. Chapter 7 investigates whether treatment expectations (improvements the patient will achieve for themselves) and credibility (how believable, convincing, and logical the treatment appears) are associated with the outcome of rehabilitative treatment of patients with CLBP. It is hoped that insight into modifiable predictors, such as treatment expectations (and credibility), can improve the management of this population. Previous studies have offered insight into predicted outcomes with regard to the perceptions of expectation and credibility, however, psychometric data is lacking. The results of Chapter 7,

although low to moderate in predictive power, shed promising light that expectation and credibility are associated with outcome in rehabilitation of individuals with CLBP. Additionally, the results on the psychometric properties of credibility and expectation, as measured by Credibility/Expectation Questionnaire (CEQ), are promising as well. It is important to note, however, that credibility and expectation did not predict pain intensity.

Chapter 8⁹ investigates the clinical use of 6 physical performance tests (5-minute walking, 50-foot fast walking, sit-to-stand, loaded forward reach, 1-minute stair climbing, and Progressive Iso-inertial Lifting Evaluation; PILE) in a rehabilitation population of individuals with CLBP. Specifically, task experience was investigated to see if it affected the test-retest reliability for the 6 physical performance tests. Fifty-three individuals (30 with no task experience and 23 with previous task experience) participated. Task experience did not significantly influence the test results. 5 of the 6 tests seemed clinically appropriate. Findings on the PILE test raised questions with regard to its clinical utility.

In assessing patients with CLBP, outcome measures have been the primary mode of assessing daily function. A limitation of the use of outcome measures is that they may not be reflective of the patient's actual capabilities. Objective measures of body function, such as muscle strength and mobility that are traditionally used in the clinical setting, have been questioned with regard to their correlation to activities of daily living. In contrast, physical capacity tasks have been advocated in the evaluation of CLBP. Although these tasks, in addition to self-reported disability, also exhibit low to moderate correlations, they show higher correlations than measures of body function (muscle strength and mobility) and self-reported disability. The ability to perform physical capacity measures can be affected by various aspects of the patient presentation (i.e., age, gender, depression, pain cognition). Fear of injury or movement has also been postulated as having an effect on physical capacity performance. The fear-avoidance model proposes that catastrophizing enhances fear, initiates activity avoidance, and contributes to disability, disuse, and depression. Patients with these characteristics would, therefore, be expected to have difficulty with physical capacity tasks that are used to assess their capabilities for activities of daily living. Research investigating the validity of these postulations is scarce. Thus in Chapter 9¹⁰, Dr. Smeets sets out to investigate the effect of personal factors and body functions on common physical capacity tasks used to evaluate CLBP. 223 subjects from a previous RCT were analyzed. 6 tasks (5-minute walking test, 50-foot walking test, sit-to-stand test, loaded forward reach test, 1-minute stair climb test, PILE-test weight-lifting from floor to waist) were investigated. Out of the 223 subjects, 221 had complete data sets. The results of the study suggest that cardiovascular capacity, pain intensity, and personal factors (i.e., fear of movement/injury, cognitions, and depression) had limited influence on the outcome of the different physical capacity tests. Men outperformed women on tasks due to anthropometric differences. The selected capacity tests did not appear to be influenced by many personal, physical, and psychological factors. Thus these tasks may be objectively measuring physical capacity.

Smeets' study investigated 3 primary areas relevant to patients with CLBP. First, do patients with CLBP exhibit signs of physical deconditioning when compared to matched health subjects and do these signs change with restorative treatment? Second, is the combination of model-based treatments more effective than single treatments in patients with CLBP? Third, what is the reliability and clinical utility of physical performance/capacity tasks and are personal variables, body functions, and level of performance by individuals with CLBP associated with performance on the capacity tasks?

With regard to question one, the results of Smeets' work suggest that individuals with CLBP have significantly lower levels of aerobic capacity when compared to matched controls (age, gender, and level of sport activity). Investigation of low back muscle morphology revealed limited evidence of wasting, in particular the deep multifidus musculature. However, specific intensive training of the multifidus musculature is more effective than less intensive training in CLBP individuals with low to moderate disability. On question number two, the results suggest that there is no additional benefit of a combined approach of physical (APT) and cognitive-behavioral (CBT) treatment models. In fact to the contrary, there is some evidence to suggest that the combination of the two models created a trend toward adverse effects. Finally, for the third question, the results of the study indicate that the PILE-test should not be used in clinical practice. Although the results indicate good clinical utility of the remaining 5 tasks, for some subjects the tasks were too much while not enough for others. Smeets suggests further development of specific performance tasks. Furthermore, the lack of influence on the test results by personal, physical, and psychological factors suggested that the five tests are objective measures of individual physical performance/capacity.

In closing, Smeets needs to be commended for his contribution to the body of knowledge regarding the management of individuals with CLBP. His work has provided the rehabilitative branch of medicine with further insight, disproving some assumptions while supporting others. As patients with LBP can account for 50%¹¹⁻¹³ of the population serviced in outpatient physical therapy clinics, based on the work by Smeets, the OMPT community will be better prepared with evidence-based treatment recommendations for this population.

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