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Chronic Low Back Pain and Different Structures of the Body

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Abstract

It is important from a treatment perspective to address these individuals functionally, that is, devising specific strategies or activities to improve strength, flexibility, and endurance of those muscles and related areas. These areas are those that inflict higher interference and functioning tolls to the patients and should be addressed in any rehabilitation paradigm for these patients.

Keywords: Activity interference; Pain interference; Health fund; Method variance; Acute pain; Isometric contractions

Introduction

Turner and colleagues found that patients who reported more pain sites before participating in a cognitive-behavioural treatment had higher activity interference; therefore, treatments for NMD patients should rely on pain intensity in specific sites than overall pain intensity ratings. Moreover, each pain site might require different approaches, with specific combinations of rehabilitation alternatives. Our pilot study found that the other pain location significantly contributed to the variance of pain interference. It was just a small group of participants that reported experiencing pain in a location or locations other than those in the survey [1]. However, there seem to be other locations that are important to explain pain interference in people with an NMD and chronic pain beyond those analysed in this study. Future work might build on the findings of this study by attempting to determine other pain locations that might be of importance for these patients to address them when developing treatment programs. Some important limitations to the available published literature should be considered when interpreting the results. Most patient samples primarily include patients registered with the national Institutes of Health funded MD National Registry, and the extent to which the findings from these patients are broadly applicable to individuals with other forms of NMD is not known [2].

Discussion

Moreover, all information is usually based on self-report measures. Therefore, it is possible that some of the significant associations found between measures may, therefore, be related to share method variance. Future researchers should examine the associations between pain at different sites and more objective measures of patient functioning, such as ratings made by spouses or significant others, or objective measures of activity. Despite limited data, the available studies provide support for the potential utility of assessing specific pain qualities and overall pain intensity measures in persons with slowly progressive NMD, hence, the need for more studies of the influence of pain site and extent in patients with slowly progressive NMDs. Further studies are needed to explore and confirm these complex interrelationships. Nevertheless, there seem to be enough data, both from chronic pain populations and from patients whose pain is secondary to a disability, to support the inclusion of pain quality characteristics as outcome variables in pain research. Trunk muscle strength was measured during maximal isometric contractions using a dynamometer with a dual position back extension/flexion seat attachment. The participants were seated on the adjustable seat, fastened with velcro straps over the torso, hip, and thigh to isolate the trunk movement. The axis of the dynamometer was aligned with the subject's L5/S1 disk space [3]. After an initial warm up consisting of several submaximal and two to three maximal contractions, the participants performed maximal isometric trunk extension and flexion contractions at three different trunk positions. Zero-degree trunk angle corresponded to the neutral-seated position with negative values in extended and positive values in flexed trunk position. At every position, the participants completed one trial in extension and one in flexion in order to avoid the appearance of fatigue during the test [4]. All contractions were performed in a randomized order and, during the experiment; the participants were verbally motivated to ensure maximal effort. The participants were interviewed about their perception of pain and effort during the maximal voluntary contractions to exclude any acute pain effects on the muscle strength measurements. In all our measurements, participants did not mention any pain during any of the trials. Three minutes of rest was allowed between the contractions. For the analysis, moment values were normalized to body mass [5]. Neuromuscular control of spine stability was analysed by determining the trunk instantaneous stiffness and damping after sudden perturbations as well as the local dynamic stability during repetitive trunk movement. In the current study, we aimed to investigate the athletic-based specificity of muscle strength and neuromuscular control of spine stability in non-specific LBP. Therefore, we compared the trunk muscle strength as well as the neuromuscular control of the spine after sudden quick release perturbations and during a repetitive lifting task in athletes and non-athletes with and without LBP [6]. We hypothesized different pathology-related effects in athletes and non-athletes in trunk muscle strength and LBP related deterioration in neuromuscular control of spine stability in both groups. We found in athletes and non-athletes lower muscle strength of the trunk extensors during maximal isometric contractions and properly adapted neuromuscular spine control after the quick release perturbation in our LBP patients. These results indicate similar neuromuscular alterations in athletes and non-athletes, and therefore our hypothesis needs to be rejected. In agreement to earlier studies, we did not find any differences in the maximum trunk flexion moments between healthy and LBP participants in both the

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athlete and the non-athlete groups, indicating no specific LBP-related deterioration of the trunk flexor muscles. Although chronic non-specific LBP is a complex and multifactorial process, a deconditioning of the lumbar extensor muscles has been often associated to chronic LBP. Furthermore, it is widely accepted that resistance training aiming to improve trunk muscles strength is a successful therapeutic modality for reducing LBP and improving functional outcomes. The average training volume of the athletes included in the study was 11h per week with regular muscle strength exercising [7]. Therefore, we expected at least a lower deconditioning of trunk extensor muscle strength compared to non-athletes. Yet we found a similar LBP-related decrease in the maximum trunk extension moments in both groups, indicating deficits in the trunk extensor muscle strength even at the high competitive level of athletes. A reason for this deficit could be the neglect of specific strength training focusing on the stabilization of the spine in athletes. Several review studies revealed that the majority of the practitioners recognize the benefits of strength training in athletes, but mainly focus on exercises to strengthen muscles which are directly related to the specific athletic performance, downgrading the importance of supplementary trunk stability or trunk strengthening exercises. Training recommendations for elite athletes mostly target superficial big groups of muscles and less the deeper and smaller muscles, which stabilize the spine [8]. Specific strength training for the trunk muscles seems not to be successfully integrated in the athletic practice compared to exercises, which target muscle groups that primary affect athletic performance. There are several reports providing evidence that strengthening the muscles of the lower extremities as for example plantar flexors, knee-hip extensors, and hamstring muscles provide important performance benefits in different sport-disciplines. On the contrary, a recent systematic review and meta-analysis study evidenced that trunk muscles strength training shows a limited association with athletic performance. However, our results indicate a deconditioning of the trunk muscles, not only in the general population but also in well-trained athletes with LBP. These results suggest that specific strength training of the trunk muscles could help patients to reduce LBP not only in the general population but also in a highly trained population like elite athletes [9]. A reduction of LBP in the athletic practice would not only improve the health of athletes but would also have long-term beneficial effects on athletic performance. Further prospective studies are needed to assess the effectiveness of specific conditioning therapies on LBP prevention in the athletic population. Beside reduced muscle strength, deficits in the neuromuscular control of spine stability have been reported to be another possible risk factor for the occurrence of LBP. Especially after sudden perturbations, the ability of the nervous system to perceive sensory signals and generate appropriate motor commands stabilizing the spine can be a crucial element to protect the spine from injury and pain. In our experiment, we did not find any differences in trunk stiffness between LBP and healthy participants neither in athletes nor in non-athletes, indicating an effective stabilization of the spine after the quick release perturbation. The challenge of stabilizing the trunk after the induced perturbation was quite high, and thus appropriate trunk stiffness was important to generate smaller and slower trunk displacement to counteract the perturbation. The LBP patients in both the athlete and the non-athlete groups showed a higher damping coefficient and shorter onset times of the erector spinal muscles. An earlier activity of the trunk muscles in response to sudden perturbations may represent a strategy for pain and injury prevention. Damping is an important intrinsic factor in the musculoskeletal system and an essential component of spine stability control. Higher damping values reflect an effective spinal control because a poorly damped trunk system would continue oscillating after a sudden perturbation. Therefore, an increased damping after sudden perturbations has been previously interpreted as beneficial for the effective control of spine stability in the presence of LBP. These findings indicate a properly adapted spine control after the quick release perturbation in our LBP patients. We can argue that the athletes and non-athletes with LBP included in our study did not present any deficits in the neuromuscular control of spine stability, at least compared to healthy controls. The maximum Lyapunov exponents did not differ between the groups or the LBP conditions, indicating that the local dynamic stability of the trunk motion was independent of the presence of LBP in both athletes and non-athletes [10]. Similar results were also reported by Graham and Asgari. A recent study also found unchanged local dynamic stability of the trunk motion despite a significant reduction in LBP after an exercise therapy.

Conclusion

To our knowledge, the only study that reported increased instability of trunk kinematics in the presence of LBP used a heat-capsaicin model to introduce the LBP. It seems that a simulated acute increase in LBP may affect the ability of the spinal system to counteract and compensate neuromuscular control errors in order to maintain spine stability in a different manner as real chronic LBP in patients. It can be argued that our chronic non-specific LBP patients were able to overcome instabilities and control errors during the repetitive lifting task.

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Conflict of Interest

None

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