



Immune responses following McKenzie lumbar spine exercise in individuals with acute low back pain A preliminary study

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The pathophysiology of low back pain (LBP) and disk-related sciatica is not limited to mechanical compression of the neural tissue. Inflammation and inflammatory mediators, has been implicated in the production of acute or chronic pain. This study analyzes the immune responses following 4 weeks of McKenzie lumbar spine exercise in individuals with acute low back pain (ALBP). Participants were 15 volunteered patients with ALBP. Ten ml of incidental blood were obtained from each patient before and after 4 weeks of McKenzie exercise intervention. All patients underwent subjective and objective assessment. Intervention was bespoke following McKenzie assessment and treatment protocol. For a reference purpose similar blood samples was obtained from 15 healthy individuals. Flow cytometric analysis was used to evaluate the frequencies of CD4+ T cell sub-populations and therefore the intracellular cytokine expression within this cell population. Pain perceptions were obtained at baseline and following hebdomadally of exercise sessions.

A key challenge in low back pain research is the identification of homogeneous subgroups according to evidence-based classification systems. One classification system that has the potential to improve outcomes is the Mechanical Diagnosis and Therapy (MDT), or McKenzie, method.^{12,32,33} Classification according to this approach uses the patient's history, clinical presentation, and a physical examination. Patients are categorized into 1 of 3 main syndromes to guide treatment decisions. In MDT, important clinical signs and symptoms are centralization (CEN) and directional preference (DP). Centralization and DP are nontransient therapeutic responses that are elicited during the MDT assessment and observed in some patients. Centralization is a phenomenon by which distal pain originating from the spine progressively moves to, and remains in, a more central location in response to certain postures or repeated end-range movements. When only midlumbar pain is present, CEN requires resolution of the pain or reduction in the area of pain. Directional preference encompasses a broader range of responses than CEN and describes the clinical phenomenon in which certain postures or repeated end-range movements result in a clinically relevant, lasting decrease in symptom severity and/or positive mechanical response, such as an increase in range of motion (ROM), though not always a change in location of pain. Thus, all patients categorized as CEN have a DP, but some patients with a DP do not have CEN.⁵¹ Patients who have a response of DP with CEN or a response of DP without CEN

are prescribed direction-specific exercises concordant with their DP. Although the underlying physiologic mechanisms are still uncertain, DP with CEN and DP without CEN have been studied extensively. Research has shown that pain diminishes and mobility improves more rapidly in patients who receive direction-specific exercises concordant with their DP (eg, extension exercises) than in patients receiving nonconcordant exercises, or in patients without a DP.^{8,28} Directional preference with CEN and DP without CEN appear to be useful treatment-effect modifiers and indicators of prognosis,^{17,32} although recent research suggests that DP without CEN may be a less useful prognostic indicator than DP with CEN.⁵³ Clinicians who use MDT frequently observe rapid improvements in spinal control (a better balance between stiffness and movement¹⁹) or a reduction in neurological signs when patients with DP with CEN or DP without CEN are treated with directionspecific. This rapid and spontaneous improvement in spinal control in patients who receive direction-specific exercises matching their DP could be an important clinical finding. Impaired spinal control may potentially be an important factor in the persistence or recurrence of nonspecific LBP.¹⁹ Moreover, understanding the influence of MDT on spinal control may provide additional insight into the mechanisms mediating outcomes of MDT. Furthermore, if MDT can improve spinal control rapidly in a specific subgroup of patients with LBP, then it is reasonable to suggest that, for this subgroup, the MDT method could be a useful alternative or supportive treatment in spinal control management. Based on the absence of evidence to explain the underlying physiologic mechanism of DP with CEN and DP without CEN, the primary aim of this study was to systematically evaluate whether clinical signs of impaired spinal control improve in patients with nonspecific LBP after an MDT assessment, and whether this differs between the 3 MDT pain-pattern subgroups (DP with CEN, DP without CEN, and no DP). Following recent research suggesting that DP without CEN might be a less useful prognostic indicator than DP with CEN,⁵³ we hypothesized that a larger proportion of patients in the DP-with-CEN subgroup would exhibit improved spinal control than patients categorized as DP without CEN or no DP. The secondary aim was to evaluate whether pain severity and ROM would improve after an MDT assessment, and whether these improvements would be related to the 3 MDT pain-pattern subgroups

This study was a single-group, within-subject, test-retest design. The Institutional Scientific Review Board of the EMGO Institute for Health and Care Research approved the study. The Medical Ethics Committee of the VU University Medical Center concluded that no formal approval was required according to the Dutch Medical Research Involving Human Subjects Act. Patients were recruited from 3 private multidisciplinary clinics in the Netherlands (Medical Back Neck Center in The Hague, and the Ruggoli in Delden and Tilburg), and from 1 private physical therapy practice in Belgium. Consecutive patients presenting for treatment of LBP received written information about the study. Eligibility criteria were LBP as the primary complaint, with or without associated leg pain; visiting the practice for the first, second, or third time for the current LBP episode; aged over 17

years; and able to read and write Dutch.

There was no significant difference in the frequency of T lymphocyte sub-populations; memory (CD4+CD45RO+) T cells, helper inducer (CD4+CD29+) T cells, CD3+CD16+CD56+ T cells and naive/suppressor (CD4+CD45RA+) T cells at bottom line relative to those cell populations after exercise sessions. Pain was significantly reduced after 4 weeks of McKenzie exercise

interventions ($p < 0.05$). The percentage of T cells expressing pro inflammatory cytokines IL-8 and TNF- α and antiinflammatory cytokine IL-4 increased significantly ($p < 0.05$)

Conclusion: McKenzie exercise induced an immune activation state and simultaneously up regulated antiinflammatory IL-4 cytokines that boost pain relief.