**LITERATURE REVIEWS**

**Summary and Perspective of Recent Literature**
*Paul Nelson, PT, Dip. MDT*

**Stynes, et al. (2016). Classification of patients with low back-related leg pain: a systematic review.** *BMC Musculoskeletal Disorders*; 17:226

Stynes et al undertook this study to better understand the classification of patients with low back related leg pain. This subgroup is associated with increased levels of disability and higher health costs, but has no consistent and clear definition to identify low back-related leg pain (LBLP) due to nerve root involvement. This review looks at the relevant literature that classifies or subgroups populations with LBLP, and how leg pain due to nerve root involvement is described and diagnosed in the various systems.

A lit search identified 13,358 papers that were eligible. The authors also hand–picked from a review of referenced articles that were cited, producing an additional 21 papers. From this, 50 relevant papers were identified that reported on 22 classification systems. Five themes were identified:

> Classification System Themes
> (1) Clinical Features
> (2) Pathoanatomy
> (3) Treatment-Based Approach
> (4) Screening and Prediction Rules
> (5)Pain Mechanisms

**CLINICAL FEATURES**
This category included six papers. The Quebec Task Force Classification was the only system that had supporting work on validity and generalizability. Of interest is a study by Werneke et al in 2004 that compared the QTFC system to classifying whether leg pain centralized or peripheralised. Centralizaiton or peripheralisation was superior in predicting outcomes and long term work status. There were no reliability studies identified for the QTFC. Kappa value for physicians reviewing case studies was 0.69.

**PATHOANATOMY**
This category included six classification systems which tried to identify the patients' source of pain. Overall, the systems did not fare well due to lack of supporting work on systems validity and generalizability. All the systems studied recognized the lumbar disc as a source of pain, facet joint was included in five of the systems, four included stenosis, leg pain of radicular origin was recognized as a pain producer in all six systems, but nomenclature and consistency of definition varied widely. One study by Petersen et al, showed a low kappa value of 0.31 with chosen reference standard (Imaging, injections or discography).

**TREATMENT BASED APPROACH**
This category included four treatment-based classification systems. McKenzie had good support for its validity, reliability and generalizability. Peripheralization was a good predictor of outcome and there was conflicting evidence for inter-rater reliability. Overall, there were few studies included on McKenzie assessment and treatment in this systematic review.

Hall et al described five patterns of low back pain including leg pain, (treatment in this system is very loosely based on the limited use of McKenzie principles). Their terminology included 'painful discs', 'worn spinal joints', 'pinched nerve' and 'bony spurs within the spine'. Further study by Hall demonstrated that patients classified according to their system had more pain relief post treatment, resulting in less treatment days and patients were less likely to use medications. The study had several limitations that would significantly damper any positive conclusions drawn (cohort vs randomized controlled trial, significant baseline differences between groups). Reliability was good with a kappa of 0.6.

Albert et al classified patients with sciatica according to whether their pain centralized, peripheralized or did not change. All patients received exercise and advice. Improvements were seen in both peripheralizers and centralizers which the authors state refutes some of the McKenzie model theory. Interestingly, symptoms centralized in over 90% of the patients with MRI confirmed sequestrated of

extruded discs. Essentially this is a study exploring the McKenzie system, but in this review was deemed to represent a separate classification.

**SCREENING TOOLS/CLINICAL PREDICTION RULES**
This category included three papers. The purpose of the system is to identify clinical features that either guide diagnosis or assist in treatment. Fritz et al. identified a subgroup of patients who benefited from unloading (traction) when the peripheralized with extension. Scholz et al. used statistical methods to identify items in a standardized assessment that would differentiate between LBP patients with and without radicular leg pain. Roach et al. used screening test algorithms, based on a questionnaire to place patients into four predetermined "structure based" classifications (disc, spinal stenosis, disc disease with spinal stenosis and benign low back pain). The reliability of Roach's system had kappa values ranging from 0.57-0.91. Scholz's system identified patients with radicular pain with high sensitivity and specificity. However, there was no published work on applicability of the rules to different populations.

**PAIN MECHANISMS**
Three pain mechanism systems were identified; Smart et al used statistical analysis to identify discriminatory clusters of signs and symptoms related to each of the categories. Smart's system classifies into:

Smart et al's Classification System
1. Central sensitization pain
2. Peripheral neuropathic pain
3. Nociceptive pain

There was some support for the discriminative validity of the system. Reliability kappa values were substantial at a Kappa of 0.77.
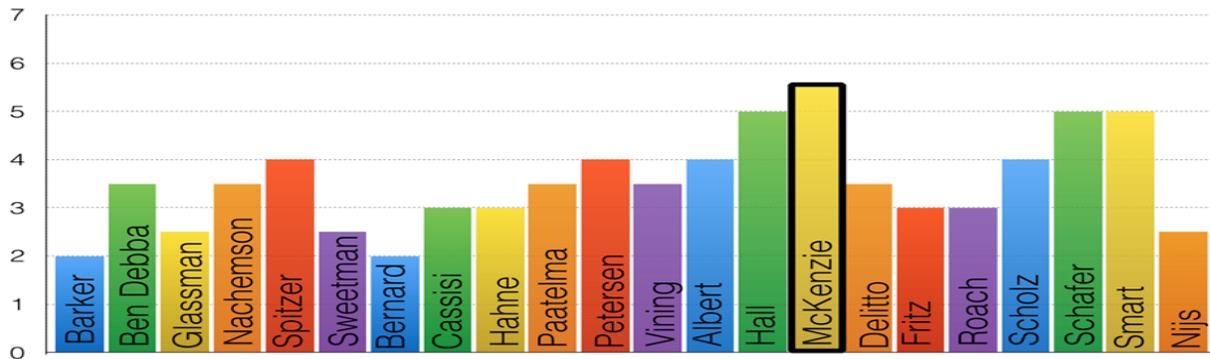
Schafer et al. described a four-group system:

Schafer et al's Classification System
1. Central sensitization
2. Denervation
3. Peripheral Nerve Sensitization
4. Musculoskeletal

Reliability for the Shafer system was substantial with a Kappa of 0.72. Some doubts were expressed about the construct validity of this system.

Overall, there was a significant lack of consistency of terminology between all of the systems used. Up to 11 different terms were used for nerve root presentations. Findings from the clinical examinations also showed great inconsistencies between systems, from being very specific to being very vague. The validity of the systems was very poor, particularly in content and construct validity. There were very few systems that had any reliability data. The ability to judge the generalizability of the systems was very limited as well. Only three of the 22 systems focused specifically on LBLP patients. Within all of the systems the need for a more common language to define nerve root involvement and clinical criteria to diagnosis it was very evident.

The authors went on to conclude that the QTFC was the best place to identify leg pain due to nerve root involvement. McKenzie was given a brief mention in the discussion, but was dismissed based on the minimal studies included where McKenzie was not deemed superior to other treatments, even though they stated that its validity, reliability and generalizability had been supported in the literature. Interestingly, McKenzie principles were echoed in three of the five themes identified by Stynes et al. Centralisation and Peripheralisation were mentioned on three separate occasions as good predictors of outcome. Overall though, the McKenzie system scored the highest of any system in any category, as seen in the graph on the following page.

Out of a maximum of seven, the McKenzie system scored 5.5 on criteria based on content validity, face validity, feasibility, construct validity, reliability and generalizability. Two independent reviewers scored the systems.

Since the purpose of the study was to identify how leg pain to nerve root involvement is described and diagnosed in various systems, it seems that language and lack of consistency has gotten the better of us. Using such different language, the diagnostic accuracy of identifying such subgroups on a consistent and reliable basis. What was underscored was the need for more consistent language and nomenclature, so that when clinicians are speaking, we, as a group, are all on the same page. As within the McKenzie system, when a clinician talks about a Derangement a clinical picture emerges that allows for a clinical conversation to ensue. What has emerged from this study is the need for a common language so that clinicians can be part of the bigger conversation that helps to diagnose and treat low back related leg pain. In the long run, McKenzie belongs in that conversation and can be at the forefront because its identification of centralization and peripheralisation and essentially the identification of Derangements have such a big impact on outcomes, as well as performing all the legwork for validity, reliability and generalizability.

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**Summary and Perspective of Recent Literature**
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**Thackeray A, Fritz J, Childs J, Brennan G. (2016). The Effectiveness of Mechanical Traction Among Subgroups of Patients with Low Back Pain and Leg Pain: A Randomized Trial.** *J Orthop Sports Phys Ther*; 46: 144-154.

The study had two purposes:

- To examine the effectiveness of traction in patients with nerve root compromise within a specific subgroup in the Treatment Based Classification (TBC) system.

- To determine if mechanical traction in addition to an extension oriented treatment approach (EOTA) will have better outcomes than an EOTA without traction after six weeks, six months and one year.

It has long been proposed that classifying LBP patients and making treatment decisions based on a patient's clinical presentation would yield better outcomes. Mechanical traction in the treatment of LBP with nerve root involvement has been used for many decades, but, as yet, has unproven efficacy. Some clinicians feel that traction may have a place in musculoskeletal care with patients presenting with highly 'irritable' symptoms, a greater intensity of leg pain and exhibiting signs of neurological compromise. Initial studies conducted by Fritz (2010) found greater improvement in disability in the first two weeks of treatment using an EOTA with traction, but no difference at six weeks.
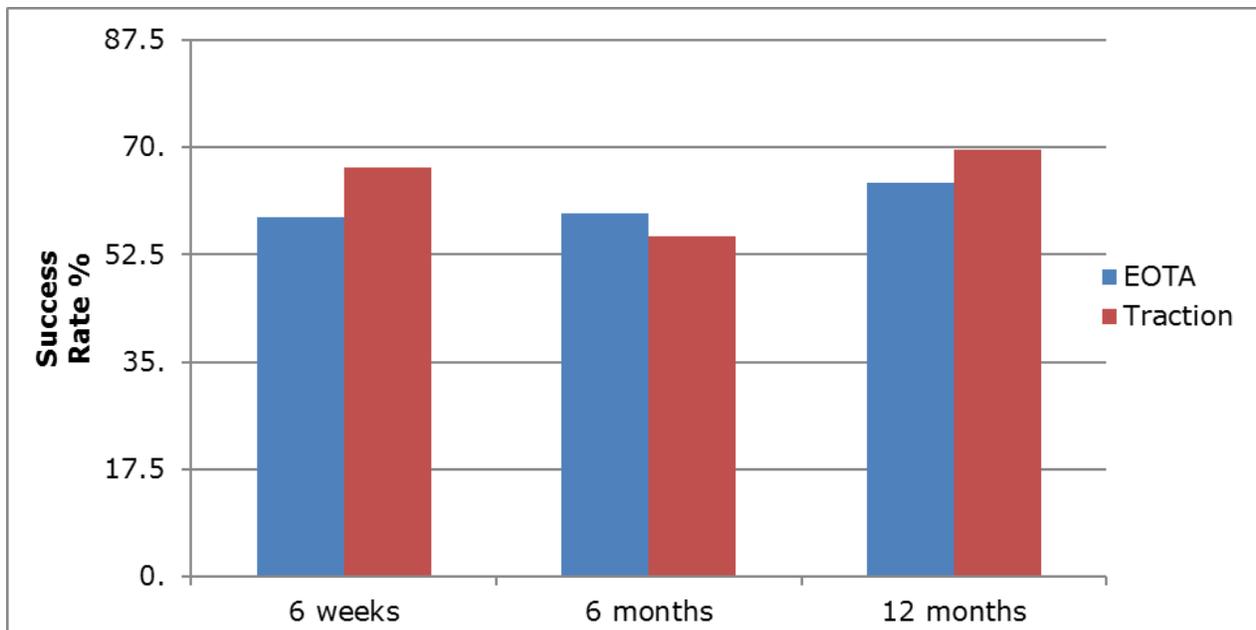
A subgroup criteria was first defined in the TBC system identifying patients who would likely benefit from traction. Patients who either peripheralised with extension movement on testing and/or those who exhibited a positive crossed straight leg raise (CSLR) test were proposed to benefit.

This study examined changes over time (six weeks, six months and one year) and interaction between treatments and subgrouping status. An intention-to-treat analysis was used to account for lost participants. 120 patients with LBP and signs of nerve root compression were randomized using predefined subgroup criteria at baseline. Patients who peripheralized with one extension movement and/ or had a positive crossed SLR were assigned to the EOTA with traction, and those who were negative on both of these findings were assigned to the EOTA. The study outcomes included the Oswestry Disability Index (ODI), global rating of improvement, as well as average LBP and leg pain.

**RESULTS:**
At the end of 12 months, 49 participants were lost to follow-up and 71 completed the study. The proportion of patients reporting a successful outcome at six weeks, six months and one year did not differ between groups, even when analyzed by matched treatment.

The table below shows the percentage of participants reporting a successful outcome at each timeline. Furthermore, reports on treatment side effects were obtained at six weeks and found no significant differences between treatment groups in severity of reported side effects.



A successful outcome was defined in the study as a patient who reported his/her change in global rating scale with treatment as "quite a bit better" or "a very great deal better."

Correspondingly, the authors analyzed the impact on duration of symptoms as a predictor of poor prognosis, but this only had a 'marginal effect'. Patients lost to follow-up (n=49) had a higher level of leg pain intensity, higher scores in Sciatica Bothersome Index, FABQ-work, and Pain Catastrophizing scale.

**VIEWPOINT:**
The aim of this well-designed study was to determine the clinical effectiveness of adding mechanical traction to a treatment approach utlising the extension principle (which they refer to as EOTA). As MDT trained clinicians we can find many shortcomings in their EOTA treatment protocol, namely the lack of training (each clinician was given only 90 minutes of training), the lack of patient-specific clinical reasoning which should occur each treatment session according to the symptomatic and mechanical response, the lack of information of the specifics of the self-management programme (we are not informed as to whether the EOTA patients performed frequent sessions of the appropriate repeated movements throughout the day or not), and the significant number of treatments given (average 10 treatment sessions over six weeks). However, the purpose of the study was to prove the additional benefit mechanical traction can provide to patients within a specific subgroup, namely low back pain and radiculopathy, thereby justifying its continued use in some clinical settings. Their conclusion is that there is no clinical benefit to adding mechanical traction to this group of patients.

In their discussion, the authors suggest that perhaps mechanical traction could be used to determine if centralization can be achieved. However, if there is no clinical benefit to using traction, why not correctly use the repeated movement testing sequence and follow MDT protocols to determine centralisation instead?

It is certainly worth noting that despite all the patients having nerve root compromise, and the fact that it is acknowledged that this group can be "challenging and costly to manage", significant improvements were gained and maintained for all these participants with a directional-oriented approach. Though, with no control group we cannot draw too many conclusions about this how much of this change is due to the effect of the treatment itself.

There are a couple of limitations to this study that need to be taken into consideration. One is that the 120 patients were spread over nine clinics in two cities, which could make it difficult to ensure the treatment protocols were strictly followed by the number of clinicians which must have been involved. The clinicians were only given one 90-minute training session, which could result in a lack of clinical reasoning process to ensure optimal outcome. This could have been addressed by close clinical supervision, but we are not told at what level this occurred, if at all.  Another limitation is the large percentage lost to follow up (41%). This resulted in a small number of patients having adequate data at one year follow up.

This study was very specific in its patient selection, targeting those that should, in theory, benefit from traction being applied to a lumbar spine with a compromised nerve root. However, there was no benefit found, as well as there being more side effects reported with the traction group.  It does, therefore, raise the question of why some clinicians are still choosing to use mechanical traction for treating their low back pain patients. Surely, this study is another nail in the coffin for the use of lumbar traction…maybe the final nail?