

# Finding spinal 'dysfunction': frailties of testing, the tester or the test? Is it time to reframe our descriptions?

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This paper explores the relevancy of manual testing in the spine and how this may contribute to the notion of "dysfunction". It looks critically at positional palpation, motion testing and pain provocation. Clinical reasoning and how this can be applied to the patient's barriers to recovery is highlighted with reference to a model that attempts to capture a sensible, clinical, critical approach to the choice of testing, enabling clinicians to generate clear rational decisions in the use of spinal testing.

## LEARNING OUTCOMES TO SUPPORT PHYSIO FIRST QAP

- 1 A greater understanding of the relevancy of palpation findings.
- 2 Improved awareness of the research underpinning the assessment of movement in the spine.
- 3 Improved contextual understanding of the role of manual therapy assessment in spinal pain.

The term "dysfunction" in musculoskeletal physiotherapy is a well used – perhaps overused – term that suggests, in essence, there is something wrong; that function, whatever that may be, is sub-optimal in the neuro-musculoskeletal system. When concerning ourselves with the use of this term and its application to spinal pain, there are numerous further sub-descriptions within the health professions and between them that go on to describe something that appears to be wrong, sub-optimal and requiring intervention. "Somatic dysfunction", "subluxation", "misalignment", "resistance" and many others are terms that bridge many professions that utilise hands-on therapies in the aim of resolving these "dysfunctions", with the proposal that patient outcomes will be

improved and altered from dysfunctional to functional.

So, what is the consensus on what "dysfunction" actually is? Is there relevancy to this, how can it be applied, and does it matter? These are important questions and ones this article will attempt to consider.

Many authors in the field of manual therapy propose that the mechanism underpinning the clinicians' interpretation of a loss of spinal function at a vertebral level links to para-spinal activity. Assessment of this activity is proposed as a method of ascertaining a baseline and creating hypotheses that either support the dysfunction theory or negate it. Changes in para-spinal activity have been observed in low back pain, either through movement, static postures and reactions to stress (Fryer *et al* 2004). This proposed observable phenomenon is thought to be understood in a number of ways; watching, asking, touching, analysing being the key assessment principles, but this is only a small part of the battle as these observations can be judged to be relevant only under a number of clear proposals:

- That the assessment of a sub-optimal neuro-musculoskeletal vertebral function is possible.

- There is a "normal" that we can baseline and therefore assess against.
- We can demonstrate a clear link between a change in local soft tissue reactionary activity via treatment, and improvement in patient reported outcomes.

When reviewing the literature and making generalisations across / within professions regarding interventions or clinical paradigms, it is first useful to understand our own clinical bias towards what we believe are effective assessments and treatments. Therapists will propose hypotheses that they want to maintain as robust, as it gives clear guidance towards the treatment and intervention they apply, such as "the soft tissues are tight, they need to be stretched" and through confirmation bias, enables a link to every test and response to this hypotheses, and negates other rational questions and proposals that oppose it, such as "the literature fails to be able to justify the use of certain tests that evaluate the length of soft tissues in the spine". Therapists may propose that the literature concerning reliability for pain provocation is robust for this assessment; however, this may be without consideration of the recall bias of the patient who, after multiple palpatory techniques, may

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become biased towards the response (Malone *et al* 2014). An example of this is demonstrated in a study on the use of purposeful sampling leading to potential bias whereby manual therapists were surveyed by the International Federation of Orthopaedic Manipulative Physical Therapists (IFOMPT) who, unsurprisingly in this cohort, found that the confidence with manual testing was high and correlated positively with engagement in the literature (Karas *et al* 2016). What the actual literature and its quality was, however, was not commented on.

So, the acceptance that there will be bias to all that is done within practice, and the acknowledgement that our clinical assessment is not a binary process, and that it is multi-factorial, enhances the critical consideration of the worthiness of a single test, or even a small cluster. Clinical questions that are asked by the therapist may involve a "test" with positive and negative responses that must be developed in line with the clinical proposals made throughout the clinical examination. Therefore, even though this article looks at manual therapy tests in this way, it should be recognised that tests should be part of complex thinking that is multi-dimensional, interactive and requires the clinician to develop strategies that are not simplistic or totalising, with a framework of dynamic reflection and critical thinking (Bartlett & Cox 2002; Jones *et al* 1992).

Touch perception is described as a primary feeling rather than a thought process (Nyberg & Smith 2013), with the practitioner understanding the relationship between sensory neurones via touch receptors, and the perception and direct pain appreciation of that intensity. This then has to be evaluated and linked to associated memories

of past experiences and expectations that have been built on following the initial assessment, observations, tests and outcomes that are all part of the clinical reasoning process (Kumaran *et al* 2009). This limited framework then develops the hypothesis of relevancy. Without the question of relevancy, or "so what?", many of the palpation tests become meaningless and riddled with confirmatory bias.

Professional groups have postulated that positional tests, movement analysis, and direct pain provocation are hallmarks of manual therapy practice, and link to the vertebra or bones in terms of bony movement or position (McCarthy 2001; Vickers & Zollman 1999). Ultimately, there are a number of reasons why this proposal is flawed, as suggestions even as far back as 1952, where Travell & Rinzler postulated that muscular loss of motion is a primary reaction to pain rather than a structural lesion (Travell & Rinzler 1952), indicating that early theories were not based on bony anomalies. The theory of a muscular response to a pain experience, leading to a persistent loss of motion, is developed through a cascade of reactions (Knutson 2000; Wytrązek *et al* 2011).

Nociceptors, when stimulated within soft tissues, may elicit a motor response via muscle spindles as part of a "reflex" protective mechanism. This has been proposed to be sustained via two feedback loops (Johansen & Sojka 1991). The first loop suggests that the sustained muscle contraction creates a reduction in the local vascular supply that subsequently leads to further chemical nociception, which then further stimulates the pain response and the muscular contraction, resulting in the system self-perpetuating the pain experience. The second proposal

is that muscle spindle information that projects to the spinal cord will continue to cause a motor-neurone output which further feeds the loop. The end result is a sustained tonic, segmental tonal change that theoretically maintains a local pain response and inhibits the normal eccentric, concentric muscular action, while the tonicity generated by the intrafusal fibres inappropriately feeds the proprioceptive system, thus leading to loss changes in kinaesthesia and proprioception (Brumagne *et al* 2000; Gill & Callaghan 1998; O'Sullivan *et al* 2003).

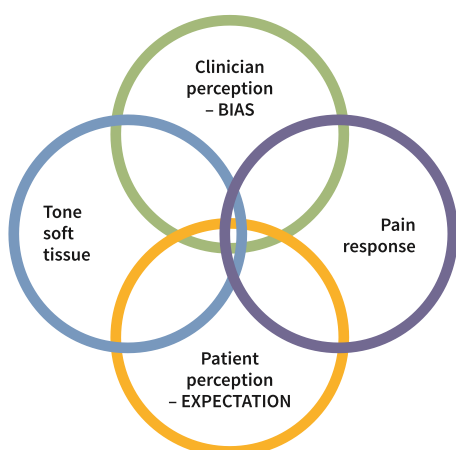
If we accept that, with spinal pain, there are potential muscular changes in the musculoskeletal system, and that one approach in establishing a normal responsive muscular system is to improve the function of this feedback system, then methods to reduce the pain response either peripherally through descending inhibition, or supra-spinally, would seem a reasonable proposal. It would also be clinically sensible to attempt to mechanically change the resting tone of the muscles, while retraining the proprioceptive system with exercise to restore a normal reaction to movement and changes in posture.

To address this theory, the treatment needs to allay fearful movement and guarding, change the pain experience, and improve the system's ability to be variable and reactive to new movements and environments. The aim being to reduce the safe, but painful and ➤

## "MANUAL THERAPY TESTS SHOULD BE PART OF A COMPLEX, MULTI-DIMENSIONAL AND INTERACTIVE STRATEGY TOWARDS CRITICAL THINKING"

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functionally unrewarding guarding and protective stability. So, how in practice does the clinician make the reasoned judgement that there is a local fault or dysfunction that is playing a part in the overall picture? Figure 1 illustrates the interactions that we, as clinicians, should be aware of when considering the assessment of local "dysfunction" for spinal pain.



**FIGURE 1:** Inter-linkages of palpation

### Positional palpation

This model proposes that suboptimal positioning of bony landmarks means a loss of function in certain directions dependent on the static palpation assessment, which can be adapted in different spinal positions. There are, however, serious flaws with this method. The intra- and inter-reliability in the sacro-iliac joint in symptomatic and asymptomatic presentation is poor, and demonstrates highly doubtful clinical utility (Holmgren & Waling 2008). Palpating through the soft tissues of the erector spinae, particularly if they are tonically hyperactive, to find and then positionally assess the transverse processes makes very little anatomical

sense. One can see that studies evaluating the depth of structures, for example the epidural space, can show them to be 8cm under the skin. Kawchuk *et al* (2011) demonstrated that the mean depth for transverse process was 6.9cm, couple this with local tissue tension and assessing for subtle alterations in position seems to render this suggested method less than adequate. Haneline and Young (2009) completed a literature review of a range of orthopaedic tests for lumbar syndromes and pointed out that the chance of errors in spinal palpation reliability studies is essentially doubled when examiners are required to name the specific level of involvement. This is because the particular level judged to be tender or misaligned might be reported as different due to misnaming the level, rather than true disagreement about the location of the problem. Therefore, even when examiners are actually in agreement and call the same location dysfunctional, they might be reporting different spinal levels due to identification problems. Some researchers have compensated for this by having an independent person mark the bony landmarks before the examiners perform their palpations. This procedure limits the confounding variable of having the palpator determine the level because the levels are predetermined. In a review of muscular changes Fryer *et al* (2004) were unable to provide any reasonable evidence on the reliability assessment of tissue texture. Fryer *et al* cite the work of Njoo & van der Does (1994) who assessed the inter-rater reliability of trigger points in the quadratus lumborum and gluteus medius and found this to be poor, although locating pain was a stronger variable. Texture or

firmness cannot, therefore, be defined as reliable indicators and without the reproduction of a pain response, nor can they necessarily be directly linked to the patient presentation. Maigne *et al* (2012) assessed the ability of the examination of palpation of muscular tension in unilateral LBP to be indicative of the site of pain. In 64% of cases the palpation of perceived "tension" correlated with the side of pain, therefore the clinical utility of these tests really must be enhanced as part of the assessment process.

### Motion testing

A further proposed mechanism of assessing dysfunction in the spine is described as motion palpation. Through manual techniques over bony prominences or soft tissues, clinicians will evaluate alteration in movement and / or tension while a movement is performed (figure 2). In physiotherapy this is classified as a passive movement, defined as a movement provided by an external agency. A study of 35 clinicians found there was poor reliability in them identifying the inter-spinous space at L5/S1 (Chakraverty *et al* 2007), a result that immediately brings into question the clinical utility of the test. This is confirmed by the previous findings of Billis *et al* (2003) who were also unable to demonstrate reliability in palpating spinous processes.

Generally, the literature surrounding motion palpation shows poor reliability inter-tester, and only slight intra-tester reliability. Conclusions either recommend not using the technique at all, or combining it with other tests that have greater validity and reliability



**FIGURE 2:** An example of motion testing in the spine

(Haneline *et al* 2008; Panzer 1992). Clearly, this test in isolation fails to offer any clinical benefit in decision making. What is required is consideration of its relevance in a complex thinking framework which, in terms of choosing manual therapy, is discussed later in this article.

## Pain provocation

The final, most common assessment tool used by the physiotherapist in a manual therapy paradigm is the reproduction of pain with palpation. This test involves mechanical pressure into tissues with the aim of stimulating the patient's familiar pain experience (figure 3). The reliability in this test is far stronger than those previously discussed. It would, however, be naïve to suggest that pressing a painful area is diagnostic, and it cannot be claimed that locating a pain response in a tissue means that is the local source.



**FIGURE 3:** An example of pain provocation in the spine

In a review of spinal assessment procedures, pain provocations were shown to be the most reliable, and soft tissue quality the least, while regional motion palpation had a greater reliability when contrasted with segmental motion palpation (Seffinger *et al* 2004; Schneider *et al* 2008). It could, however, be argued that, with any of these reliability tests, there is a lack of content validity with regard to palpation as the production of pain is possibly not a true physical finding, and the identification of the perceived symptom fails to indicate the multi-dimensional nature of spinal pain (Buchbinder *et al* 2011; Pincus *et al* 2002).

## Clinical reasoning

Perhaps it is in the complexity of the patient presentation that the issue with manual tissue based tests lies. Spine pain is a complex experience that is arguably unique to the patient, and the reactions to test procedures are intimately related to a number of confounding variables that could be related to, and alter with, each individual patient's perception of their problem. How an individual behaves, responds, understands, and perceives their pain and disorder will lead to the subjective and physical responses to testing (Foster *et al* 2008). The assumption that mechanical testing can be carried out without reference to the emotional, social, cultural, and historical perspectives of the recipient is a naïve view. The relationship between the patient and the tests / tester is also balanced with the tester and their relationship to bias, including the literature they have read and their experience, emotion, knowledge and reasoning as a clinician (Langridge *et al* 2015, 2016). When we consider this complexity, we can see why the role of singular tests is effectively meaningless, and that triangulation and direct linkages to the patient narrative is far more relevant. The question then is, how the use of mechanical testing when assessing for dysfunction, ultimately requires us to consider a reasoned approach to allow the conceptualisation of the results into a meaningful outcome.

Consider the concept of a loss of motion / increased pain with proposed associated changes in tissue biochemistry, contractile characteristics and / or fibre type changes, and alterations in the

responses of the nervous system (Fryer *et al* 2004). Therapists can approach this presentation with a number of theoretical constructs:

- That the local loss of motion is a direct cause of the patient's loss of function.
- The local loss of motion is consequence of the main cause of the loss of function.
- The pain is causing the loss of motion.
- The loss of motion is causing the pain.
- The pain is a consequence of the nature of the patient experience.

As therapists, before we even begin to consider the reliability or validity of a motion or pain provocation test, we need to understand the drivers to a lack of recovery.

By asking ourselves why a patient has not naturally recovered, we can then set up a range of pre-hypotheses that will begin the process of making sense of physical testing. Emotional, social, biomechanical, pathological, and biochemical barriers to normal homeostatic recovery and their inter-relationships gives the therapist an understanding that can underpin the assessment and outcomes of certain tests, allowing us to address the theoretical constructs, leading to the development of a sound, clinically evidenced treatment plan. Based on the patient's narrative, the therapist can extrapolate what may have been a causative factor in their presentation, what barriers to their recovery still remain, and produce a treatment plan that addresses all these factors. For example, a patient reporting a functional loss of bending that is led by the experience of pain and stiffness, with no pathological, emotional concerns, Ⓢ

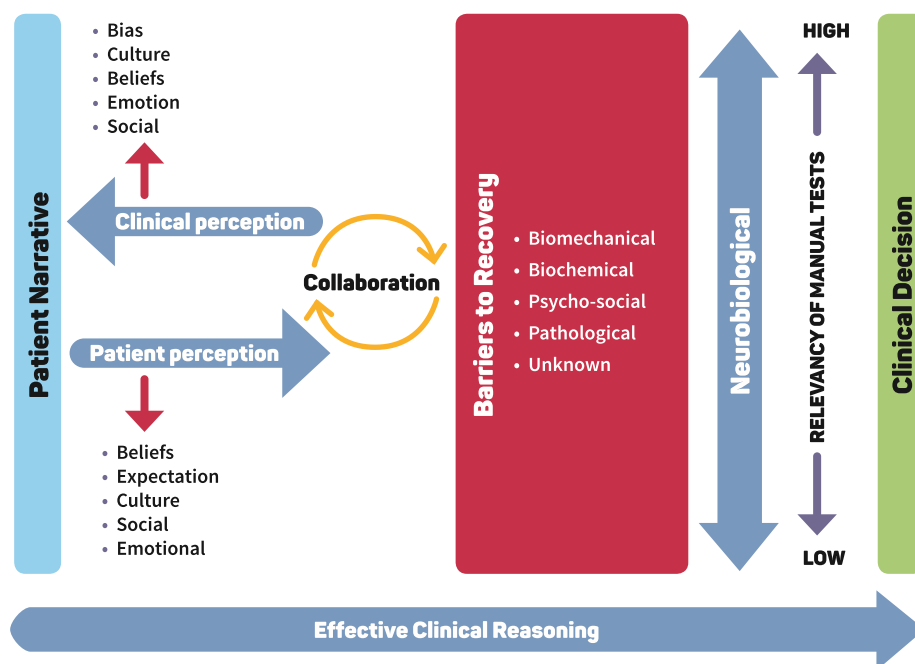
“IT COULD BE ARGUED THAT IDENTIFICATION OF THE PERCEIVED SYMPTOM FAILS TO INDICATE THE MULTI-DIMENSIONAL NATURE OF SPINAL PAIN”

**// TESTS THAT ARE BASED ON THE PATIENT NARRATIVE, AND SUBSEQUENT ASSESSMENT OF THAT NARRATIVE, CAN IMPROVE PATIENT OUTCOMES //**

and with clear patterns of movement that are reproducible in their history, would immediately suggest local / non-complex based mechanisms, potentially driven by seemingly consistent, adaptive movement patterns. In developing this hypothesis, the clinician then proposes the assessment of pain, stiffness and movement to be relevant, reproducible and would require a patient / therapist collaboration in identifying the areas of prevalence. In this scenario, movement and pain provocation tests would provide greater clinical understanding of the barrier to movement, the possible cause of related movement pain and, ultimately, the formation of a reasoned treatment plan. In direct contrast, an individual with a predominance of social and emotional related barriers to a movement or function, where the symptoms seem inconsistent with repeatable activity, would potentially still present with local barriers to movement in the spine and experience a pain response to palpation. Here, the relevance of the motion and provocation tests are less valuable as they fail to support a construct that links pain, movement and local tissue-based mechanisms with the suggestion that external drivers are the cause of the spinal “dysfunction”, rather than the other way round.

Choosing tests that are based on the patient narrative and subsequent assessment of that narrative is, therefore, proposed to be the most effective way to develop a hypothesis and, by proceeding in this fashion, the options for manual and tissue based tests and the patient outcomes would be improved.

Figure 4 illustrates the role of linking the narrative to the barrier, and to the potential relevancy of testing and how, as therapists, we might consider when



**FIGURE 4:** Clinical reasoning framework – context of manual testing

to take notice of a perceived tissue-based “dysfunction” or not. Noting the mechanical barrier to recovery would increase the relevancy of physical testing, improving the clinical decision-making process. There are many frailties to finding “dysfunction” that can only be resolved with sensible, sound reasoning, a self-critical approach, and a methodology of clinical evaluation that centres on the person in front of you and their own, specific, individual barriers to recovery rather than simple, singular mechanical tests.

### About the author

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