

Non-Dermatomal Findings, Differential Straight-Leg-Raising Tests and Other Waddell Signs

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In 1980, Gordon Waddell and colleagues summarized a number of “nonorganic signs” sometimes observed in people complaining of low back pain.¹ These have subsequently become known as Waddell Signs (WS) and are summarized in **Table 1**.^[banner]

Waddell, et al., suggested that people with signs in three or more categories should be evaluated for possible psychological disorders. Subsequently, WS have been taken out of context and suggested to be evidence of malingering. While some people who are malingering might display signs in three or more WS categories, it is noteworthy that malingering was not the original red flag to consider. Malingering is a deliberate attempt to deceive or fake an injury for the purpose of being compensated, getting excused from work, military service, etc.

Some of these WS, of course, require clear communication between examiner and examinee. Even then, they often require the examiner to make assumptions concerning which of the patient’s complaints are appropriate. The potential for examiner bias is always a potential confounder.

The notion that the straight-leg-raising (SLR) test results should be concordant between supine and standing positions has been an intuitive one. The thinking has been that SLR in either position would place the sciatic nerve in tension. Thus, if the patient failed to complain with seated SLR, yet complained of posterior thigh pain in supine SLR, they scored a WS in the “distraction” category. A fairly recent evidence-based review, however, disputes some of the WS.² The researchers found:

Category	Signs
Tenderness	<ul style="list-style-type: none">• Superficial skin tender to light touch• Non-anatomic deep tenderness not localized to one area
Simulation	<ul style="list-style-type: none">• Axial loading of spine over skull of standing patient elicits low back pain• Rotation: shoulders and pelvis rotated in the same plane elicits low back pain
Distraction	<ul style="list-style-type: none">• Differences in supine straight-leg-raising and seated straight-leg-raising
Regional	<ul style="list-style-type: none">• Weakness: many muscle groups give away weakness (patient does not give full effort on minor muscle testing)• Sensory: sensory loss in stocking or glove distribution; non-

	dermatomal
Overreaction	<ul style="list-style-type: none"> • Disproportionate facial or verbal expression (i.e., pain behavior)

- consistent evidence for WS being associated with decreased functional performance, poor nonsurgical treatment outcome, and greater levels of pain;
- generally consistent evidence for WS not being associated with psychological distress, abnormal illness behavior or secondary gain;
- generally consistent evidence that WS are organic phenomenon and cannot be used to discriminate organic from nonorganic problems;
- inconsistent evidence that WS demonstrate interrater reliability, do not correlate with the neurotic triad of the MMPI, and are associated with poorer surgical treatment outcome and nonreturn to work; and
- little or no evidence that WS demonstrate test-retest reliability or reliable factors, and are associated with self-esteem problems, catastrophizing or nonorganic pain drawing.

More recently, it was demonstrated that the SLR test was not as sensitive as had previously been expected. Some authors have suggested a sensitivity of 90 percent or more for the test. Rabin, et al., found that the supine SLR had a true sensitivity of only 67 percent.³ The seated SLR had an even lower sensitivity of 41 percent, once again underscoring the potential error in the “distraction” category of the WS. Note that the higher reported sensitivity of the SLR in earlier reports (e.g., 90 percent or higher) is likely the result of selection bias, since these earlier studies used patients who were about to undergo surgery. They may not be representative of all people with sciatica (including those who are not surgical candidates).

The phenomenon of referred symptoms, which includes numbness, tingling and pain, was proposed by Kellgren, based on his experiments stimulating deep tissues.⁴ This phenomenon was subsequently substantiated in the following decades.⁵⁻⁸ Although some of the earlier authors referred to this phenomenon as *scleratogenous*, this is something of a misnomer from an embryological standpoint. The general findings of these authors has been that reproducible patterns of symptoms can be produced by stimulating the deep tissues around the spine, but these symptoms are distinct from dermatomal patterns.

The dermatome maps were also developed in the 1930s and 1940s, and probably represented an attempt to consolidate and simplify large amounts of data such that clinicians could use reliable, non-overlapping maps for diagnostic purposes. Animal studies, however, have demonstrated a significant overlap between cutaneous regions supplied by two nerve roots. In a recent study of human volunteers, it was likewise demonstrated that the skin-surface representation of nerve roots does diverge from classical dermatome patterns in a relative high percentage of cases.⁹

These findings suggest that dermatomal maps remain a reliable guide to neurological conditions affecting the peripheral nervous system, although some variances should be expected. But injuries to paraspinal soft tissues, including periosteum, bone, ligament, disc and other connective tissues, are likely to be associated with pain patterns more typical of those previously described as referred pain.

These studies all suggest that WS be used with caution and care, and that they should not serve as an absolute or key deciding factor concerning a patient's clinical credibility. A more rigid interpretation would be that the collective best-evidence we have to date suggests that the WS have little proven utility and should be abandoned or modified.

References

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