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The Straight Leg Raising Test: An Incorrect Interpretation of Waddell's Distraction Test

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Abstract

The straight leg raising test in clinical, and particularly medicolegal practice, is being misinterpreted with serious implications for the injured worker.

Introduction

The Straight Leg Raising (SLR) test is a standard part of the examination of the lumbar spine, particularly if sciatica/radiculopathy is present or suspected. The test plays a very important role in the medicolegal setting, where it is often used to try and determine the veracity of the injured worker. Waddell's distraction test is regarded as the gold standard in the interpretation of the SLR test. The aim of this paper is to demonstrate that this test is being misinterpreted.

All doctors seeing claimants in a medicolegal setting test for veracity, either consciously or subconsciously. In studies regarding claimants consciously or unconsciously misrepresenting their symptoms, figures as high as 60% are suggested, and there are numerous articles on the subject. Malingering dates back many centuries and anthropologists have even noted feigning behaviours for perceived advantage in chimpanzees. A textbook entitled 'Malingering or simulation of disease' was published over one hundred years ago in 1917. The most well-known article on non-organic signs was published by Waddell et al. [1] in 1980 and is worth reading. Waddell received the Volvo award for clinical science for this publication and in musculoskeletal medicine we are all aware of 'Waddell's signs'. One of the important misconceptions is that Waddell's signs were intended to detect malingering which is not the case. However, we all use these signs, as well as our own personal signs, in testing veracity.

I imagine that what most people do is have a column in their minds where they put a little cross whenever something is noted that does not quite fit, such as an increased range of cervical or shoulder movement noted on indirect observation compared to the range noted on formal examination. There are numerous other more subtle

signs. I would suggest that most of us have another column in our minds, where we give little ticks for signs indicating genuine behaviour, once again either consciously or subconsciously.

The Distraction Test

In this article I would like to concentrate on one particular sign in Waddell's paper, namely the distraction test. Waddell states:

"A positive physical finding is demonstrated in the routine manner. This finding is then checked when the patient's attention is distracted. Any finding that is consistently present is likely to be physically based. Findings that are present only on formal examination and disappear at other times may have a non-organic component".

The only example that is given under the heading 'Distraction Test' is the Straight Leg Raising test (SLR). Waddell states:

"Straight leg raising is the most useful distraction test. Patients whose back pain has a non-organic component, show marked improvement in straight leg raising as compared to formal testing."

The reader is then referred to Figure 4 in the article **(Figure 1)** which shows the patient in a seated position with hip flexed to 90° and knee extended with the following caption: *"Straight leg raising improving with distraction, as when testing the plantar reflex in the sitting position".*

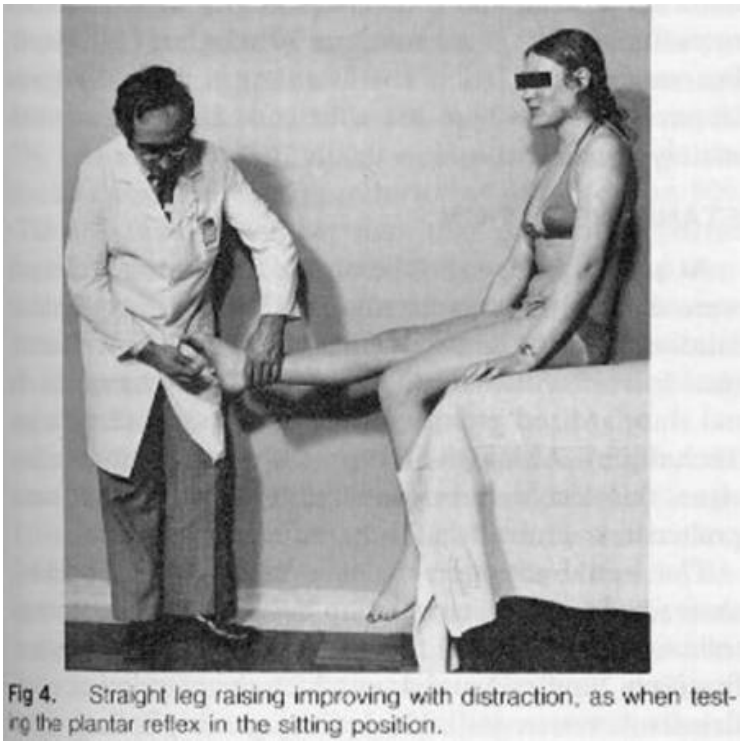

Figure 1. Waddell's distraction test.

This sign is regularly quoted in medicolegal reports as being a non-organic sign and I have never read, or heard, of this being questioned. I have, however, marked reservations about the validity of this test. I routinely find that straight leg raising in the sitting position is greater than that demonstrated on formal examination in the supine position. This is noted to be the case even in the most genuine of patients and I cannot imagine that others have not found this as well. The discrepancy (between limited straight leg raising on direct examination in the supine

position and the indirect examination in the sitting position) occurs in patients with signs of radiculopathy and also in those with tight hamstrings.

(Please refer to my YouTube video where four cases are shown with objective signs of radiculopathy who show an increased straight leg raising in the seated compared to the supine position **[2].)**

Case Study 1

A 30-year-old male who injured his back in 2014, with referred pain into his right foot and had had surgery in 2015. He was seen in 2019 with the following positive clinical signs: **(Figure 2):**

- Straight leg raising of 30° on the right in the supine position
- Absent ankle reflex
- Decreased sensation in the S1 distribution
- Weakness of eversion of the right foot

When he sat with his legs over the side of the examining couch a far greater range of knee extension (the equivalent of) straight leg raising was possible **(Figure 3).**

Figure 2: Straight leg raising of 30° on the right in the supine position.

Figure 3: Greater range of knee extension when seated.

Please note that it is most important that when sitting the patient should be instructed to hold onto the side of the examining couch to avoid extension of the spine when the leg is straightened.

Case Study 2

A 30-year-old security officer injured his back in 2011 unloading heavy bags of coins. He developed an S1 nerve root lesion on the left side but declined surgery. When examined in February 2017 he had the following positive clinical signs **(Figure 4):**

- SLR less than 30° on the left in the supine position
- Absent ankle reflex
- Decreased sensation in the S1 distribution
- Weak eversion of the left foot

Once again note the significant restriction of SLR in the supine position compared to the greater range of SLR in the sitting position **(Figure 5).**

Figure 4: SLR less than 30° on the left in the supine position.

Figure 5: Greater range of SLR in the sitting position.

Case Study 3

This discrepancy does not only occur in the sitting position, but also occurs in the recumbent position when the contralateral hip and knee are flexed.

A 37-year-old male fell 3 meters from a scaffold in 2020 and sustained an L5 nerve root lesion with sensory loss on the dorsum of his right foot and weakness of extension of his big toe. When examined in 2023 he had significant restriction of SLR on the right side in the supine position **(Figure 6)** with a significant increase in SLR on the affected side when the contralateral hip and knee are flexed to 90° **(Figure 7).**

Figure 6: Significant restriction of SLR on the right side in the supine position.

Figure 7: Greater range with contralateral hip and knee flexed.

Mechanism

What is the possible mechanism for these observations?

I would like to suggest two hypotheses as to how this phenomenon occurs in cases of radiculopathy or tight hamstrings. It should be noted that the following suggested mechanisms are not applicable in patients who are malingering or who have acute spinal conditions where any movements may be painful.

Hypothesis 1

When the patient is lying flat on the examining couch with both hips extended, the lumbosacral plexus is being anchored in a relatively fixed position. When the hip and knee are flexed in both of the situations suggested above, some of the tension is removed on both sides allowing increased SLR on the affected side.

Hypothesis 2

Restricted SLR due to tight hamstrings. Note that in the recumbent position the lumbar spine is in lordosis. In the sitting position, on the other hand, the spine is able to assume a flexed position.

In lordosis of the lumbar spine the top of the pelvis tilts forward and the bottom of the pelvis, with the attachment of the hamstrings, tilts backwards, thereby stretching and tightening the origin of the hamstrings. In the flexed position of the lumbar spine (kyphosis) the top of the pelvis tilts backward and the bottom tilts forward thereby relaxing the tension in the hamstrings and allowing increased SLR. This is readily tested on one's-self. Sit on the edge of a chair, put your heel on the ground with your knee in full extension. Put your lumbar spine in maximal lordosis and test your SLR **(Figure 8).** Now let your spine flex and note the significant increase in your SLR **(Figure 9).**

Figure 8: Hamstring tightness lumbar spine in lordosis (extension).

Figure 9: Lumbar spine in flexion.

Further Comment

I see the SLR discrepancy so regularly that I cannot imagine that others have not found the same thing. Possibly then we are simply passing on information 'from authority'. Certainly, something to think about!

Conclusion

Straight leg raising in patients with either nerve root involvement (radiculopathy) or tight hamstrings is significantly increased in either the seated position or when the contralateral hip and knee are flexed in the recumbent position. Waddell's distraction test is being misinterpreted to the significant disadvantage of injured workers. An explanation of why this occurs is suggested.

References

1. Waddell G, Mc Culloch JA, Kummel E, et al. Nonorganic physical signs in low-back pain. Spine. 1980;5:117-25.
2. Roger Pillemer YouTube: 'Testing Veracity Part 1: Video 11.

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