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Relation Between Subjective and Objective Scores on the Active Straight Leg Raising Test

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Design. Cross sectional.

Objective. To fill a gap in the validation of the active straight leg raising (ASLR) test concerning the relation between a patient's subjective score on the ASLR test and the objective measured force.

Summary of Background Data. The ASLR test is used to classify patients presenting with pain in the low back and/or pelvic girdle. Although its reliability and validity have been demonstrated, some details are still lacking.

Methods. The ASLR test was performed by 21 parous women with various ASLR scores. Subjective weakness was scored by the patient both with and without a pelvic belt; moreover the isometric forces of leg raising were measured.

Results. The correlation coefficients between the subjective ASLR score and objective measured force at 0 and 20 cm elevation were -0.58 ($P < 0.01$) and -0.52 ($P < 0.05$), respectively, at the left side; and -0.45 ($P < 0.05$) and -0.63 ($P < 0.01$), respectively, at the right side. When measured with a pelvic belt the correlations were, respectively, -0.51 and -0.48 at the left side, and -0.47 and -0.50 at the right side (all $P < 0.05$). After applying a pelvic belt the mean subjective ASLR score decreased with 0.38 point at the left side and 0.48 point at the right side (both $P < 0.05$). With the belt, the measured force at 0 cm elevation increased by 11.6% ($P < 0.001$) at the left side and by 8.6% ($P < 0.05$) at the right side; at 20 cm elevation the changes in measured force were negligible. No significant correlation was found between the subjective and the objective changes elicited by the pelvic belt.

Conclusion. The subjective scores on the ASLR test correlate well with the objective measured forces; this supports the reliability of the ASLR test. The subjective influence of a pelvic belt on the ASLR score could not be objectified.

Key words: active straight leg raising test, pregnancy, low back pain, pelvic girdle pain, sacroiliac joint. **Spine 2010;35:336–339**

After introduction of the active straight leg raising (ASLR) test in 1995 its reliability, responsiveness, and validity have been demonstrated by various studies.[1–6] The test is considered a tool to check the quality of load transfer from trunk to leg.[7] In case of a positive ASLR test, load transfer may be hampered in any link of the kinematic chain, *i.e.*, spine–sacroiliac (SI) joint–hip. However, the ASLR test is especially used by clinicians to check optimal load transfer between trunk and leg in patients with pelvic girdle pain (PGP).[8–12] In PGP, it is assumed that the test is positive as a result of insufficient load transfer due to loss of stability of the pelvic ring. Stability can be defined as the ability to bear loading without uncontrolled displacements.[7,13]

In pregnant women with PGP, the ASLR score was shown to be higher and the measured force lower, than in women without PGP.[8] In the present study, the first aim was to investigate whether this also holds for nonpregnant parous women. One of the modifications of the ASLR test is to fit the subject with a pelvic belt. *In vitro* studies have shown that a pelvic belt decreases the mobility of the SI joints[14]; this was confirmed by *in vivo* studies using Doppler imaging of vibrations.[1,15] Furthermore, calculations using a biomechanical model (including trunk, pelvis, and lower extremities) show that compressive forces within the SI joint increase when wearing a pelvic belt.[16] Therefore, the second aim was to measure the effect of a pelvic belt on the subjective ASLR score and the measured force, and to analyze the relation between the subjective and objective changes resulting from wearing the belt.

More specifically, the following hypotheses are investigated

1. The subjective score on the ASLR test correlates negatively with the objective measured force at 0 and at 20 cm elevation, both with and without a pelvic belt.
2. The subjective score on the ASLR test decreases after applying a pelvic belt; at 0 and at 20 cm elevation.
3. The objective measured force increases after applying a pelvic belt; at 0 and at 20 cm elevation.
4. The influence of the pelvic belt on the subjective ASLR score correlates negatively with the influence on the objective measured force; at 0 and at 20 cm elevation.
5. The influence of a pelvic belt correlates positively with the height of the baseline ASLR score.

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■ Materials and Methods

Subjects

Subjects were recruited from a first-line physiotherapy practice specializing in the treatment of pelvic problems; moreover volunteers were recruited among friends and relatives of the investigators. It was aimed to include subjects with a wide range of ASLR scores. Inclusion criteria were: woman, parous, aged 20 to 45 years, last delivery 12 weeks to 5 years ago; ability to fill in forms in the Dutch language, and informed consent.

The exclusion criteria were: a history of severe low back and/or pelvic pain before pregnancy; fracture, neoplasm or previous surgery of the lumbar spine, the pelvic girdle, the hip joint or the femur; or a systemic disease of the locomotor system, or indications for a specific cause of back pain. Ethical considerations were applied in accordance with the principles of the Declaration of Helsinki.

Of the 23 subjects who were considered for inclusion, 2 were excluded because of severe back pain before pregnancy. It took 7 weeks to include the subjects.

Measurements

Posterior Pelvic Pain Provocation (PPPP) Test. The PPPP test was performed as described previously.[17] If the test was positive on at least one side, the test was considered positive.

Subjective Score on ASLR Test. The outcome on the ASLR test was scored by each subject on a 6-point scale: not difficult at all = 0, minimally difficult = 1, somewhat difficult = 2, fairly difficult = 3, very difficult = 4, unable to do = 5.[6]

Assessment of Objective Force. The maximal force for hip flexion was measured just above the ankle joint during an effort lasting at least 0.5 seconds with a straight knee and the leg still lying on the examination table (0 cm position), and at the end of the ASLR (20 cm position). For the recording a digital force gauge was used; this method has been described previously.[8]

The subjective and objective measurements were performed with and without a pelvic belt. A belt of nonelastic material was used (model 3222; Rafys, Hengelo, The Netherlands), 5 cm wide at the anterior side and 7 cm at the posterior side. The belt was fastened with Velcro just caudally of the anterior superior iliac spines. The belt was maximally tightened by hand to guarantee that the minimum tension needed to influence SI joint laxity of 50 Newton was achieved.[5,8]

For all objective measurements the average of 3 attempts was used for the analyses.

Data Analysis

The SPSS software 16.0 (SPSS Inc., Chicago, IL) was used for analyses. Frequencies of normal distributed variables were expressed as mean and standard deviation (SD); variables with a skewed distribution were expressed as median and range. To analyze the difference in force between 0 and 20 cm elevation, and the situation with and without a pelvic belt, a paired *t*-test was used. To compare the subjective and objective influences of the belt a nonparametric rank test for 2 related samples was used (Wilcoxon). Correlations were computed by means of Spearman's correlation coefficient. A *P*-value <0.05 was considered significant.

■ Results

The study population had a wide range of ASLR scores (Table 1). Of the 21 subjects, 11 scored positive on the PPPP test. The measured force of the ASLR test (average of left and right side) was 88.9 (SD: 29.9) Newton at 0 cm elevation, and 61.2 (SD: 21.5) Newton at 20 cm elevation ($P < 0.001$).

Table 1. Characteristics of the Study Group (n = 21)

Age (yr), mean (SD)		30.9 (3.7)
Parity, mean (SD)		1.7 (0.9)
PPPP test positive		11 of 21 (52%)
ASLR Score	Left (n = 21)	Right (n = 21)
Distribution of the baseline score on the ASLR test in the study group		
0	6	5
1	8	7
2	2	5
3	3	3
4	1	1
5	1	0

PPPP test indicates posterior pelvic pain provocation test; ASLR test, active straight leg raising test.

Correlation Between Subjective ASLR Score and Measured Force

Correlation coefficients between the ASLR score and the measured force ranged from −0.45 to −0.63 for measurements without a pelvic belt, and from −0.47 to −0.50 with a pelvic belt (Table 2).

Change of Subjective ASLR Score With a Pelvic Belt

After applying a pelvic belt the mean subjective ASLR score decreased significantly (Table 3).

Change of Objective Measured Force With a Pelvic Belt

When wearing a belt, the measured force at 0 cm increased by 11.6% ($P < 0.001$) at the left side and by 8.6% ($P < 0.05$) at the right side. The measured force at 20 cm showed almost no change after application of the belt.

Correlation Between Change in Subjective ASLR Score and in Measured Force

No significant correlation was found between the change in subjective and objective measurements after application of the pelvic belt.

Table 2. Correlation Between the Subjective Score on the ASLR and the Objective Measured Force (Coefficients)

	Left Leg	Right Leg
Without pelvic belt		
0 cm	−0.58*	−0.45†
20 cm	−0.52†	−0.63*
With pelvic belt		
0 cm	−0.51†	−0.47†
20 cm	−0.48†	−0.50†

*$P < 0.01$; †$P < 0.05$.

Table 3. Change in ASLR Score and Measured Force After Applying a Pelvic Belt

Median change in ASLR score: data are score points (range)	
At the left side	0 (−2–+1)*
At the right side	−1 (−2–+2)*
Mean change in ASLR force: data are % (SD)	
At 0 cm left side	11.6 (13.5)†
At 0 cm right side	8.6 (5.9)*
At 20 cm left side	2.1 (4.2)
At 20 cm right side	1.7 (0.4)

*$P < 0.05$; †$P < 0.001$.

Correlation Between the Effect of a Pelvic Belt and Baseline ASLR Score

Higher baseline scores on the subjective ASLR showed a greater decrease after applying a pelvic belt than the lower scores (Table 4); this was not the case for the objective measured forces.

■ Discussion

This cross-sectional study among 21 nonpregnant women compared the subjective score for the ASLR test and the objective measured force at 0 and 20 cm raising of the leg.

Correlation Between Subjective ASLR Score and Objective Measured Force

The correlation between subjective and objective measurements was moderate to substantial (0.47–0.63) irrespective of the height of leg raising (*i.e.*, 0 or 20 cm) and the use of a pelvic belt (Table 2). The results of the present study among nonpregnant women are in line with those of an earlier study among pregnant women.[8]

The cause of the subjective feeling of difficulty to raise the straight leg in case of PGP and/or low back pain is discussed in previous publications.[4,8,10] Suggestions are: pain, fatigue, and decreased proprioception. The present study shows that anyway the weakness felt during ASLR is real.

It is proposed that the ASLR test measures disturbed load transfer between trunk and pelvis.[7] The present study supports this assumption since an increasing subjective score on the ASLR test is correlated with an increasing effort to lift a leg; this indicates that load transfer, and probably the motor strategies of muscles surrounding the pelvis, are less than optimal.

Table 4. Correlation Between the Baseline ASLR Score and Changes After Applying a Pelvic Belt

	ASLR Subjective Left	ASLR Subjective Right
Change in ASLR score: subjective	0.70*	0.61†
Change in ASLR force at 0 cm	0.21	0.02
Change in ASLR force at 20 cm	0.03	0.16

*$P < 0.001$; †$P < 0.01$.

Change of Subjective ASLR Score With a Pelvic Belt

After applying a pelvic belt the decrease in the subjective score is significant but relatively low (on average: 0.38–0.48 point). An explanation for this unexpectedly small influence could be the small study group and the relatively large percentage of subjects with a negative/very low score on the ASLR test. This is a limitation of the present study. Although we investigated 21 subjects, a change in ASLR is only logical in the case of a positive ASLR, especially with a high score (Table 4). In our study group, the ASLR score was 0 or 1 in 14 of 21 (67%) subjects on the left side, and in 12 of 21 (57%) subjects on the right side (Table 1). Therefore, only 7 left legs and 9 right legs had a sufficiently high ASLR score (2 or more) with which to assess the influence of a pelvic belt.

Change of Objective Measured Force With a Pelvic Belt

When a pelvic belt was applied the change in measured force was surprisingly small: at 0 cm the force increased by 8.6% at the right side and by 11.6% on the left side, whereas at 20 cm the change was negligible (Table 3). The pelvic belt may help to perform a submaximal task (such as raising a straight leg against gravity), but does not help to withstand large forces (as during maximal ASLR effort).

During measurement of the objective force with a belt, the resulting difference between 0 and 20 cm elevation is in line with the clinical experience that performance of the ASLR test is particularly difficult when starting from 0 cm. Generally, the higher the leg is raised the easier the task becomes, *i.e.*, most subjects have no difficulty when the leg is higher than 20 cm. Therefore, many subjects may derive no benefit from the belt when the leg is in a higher position.

Correlation Between Change in Subjective ASLR Score and in Measured Force

It was unexpected that the feeling of relief generated by a belt could not be objectified. The increase in measured force after applying a pelvic belt did not correlate with the decrease in the subjective ASLR score, or with the baseline ASLR score. An explanation could be that the influence of the belt is more related to the subject's feeling in terms of the task being "less difficult" than to requiring "more force." When raising the leg, the electromyogram activity of various abdominal and hip muscles is much higher in patients with PGP than in healthy controls.[8] The feeling of relief when a pelvic belt is attached may result from a decreased need for muscle activity during ASLR; investigating the effect of a pelvic belt on abdominal and hip muscle activity might elucidate this mechanism.

■ Conclusion

The subjective scores for the ASLR test correlate well with the objective measured force; however, the subjec-

tive effect of wearing a pelvic belt does not correlate with the measured force.

■ Key Points

- The ASLR test is used to classify patients presenting with pain in the low back and/or pelvic girdle. It is questionable if the score given by the patient is a subjective experience of weakness or a measurable decrease of force.
- This study compares the scores on the ASLR test given by the patient with the forces measured by an apparatus.
- The main finding of this study is that the scores on the ASLR test given by the patients correlate well with the objective measured forces.
- The findings support the reliability of the ASLR test to check the quality of load transfer from trunk to leg.

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