

## Original Article

# INTER-RATER AND INTRA-RATER RELIABILITY OF ACTIVE HIP ABDUCTION TEST FOR STANDING INDUCED LOW BACK PAIN

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## ABSTRACT

**Background:** Active hip abduction test (AHAbd) has previously been shown to be a reliable tool for predicting low back pain development during a prolonged standing exposure in previously asymptomatic individuals, but the reliability of AHAbd on patients with standing induced occupational low back pain has not been established. As it is an observation based test, reliability among different raters and same rater must be established. The purpose of this study was to investigate the inter-rater and intra-rater reliability of the AHAbd test as a diagnostic instrument in subjects with standing induced occupational low back pain.

**Materials and Methods:** A total of 30 subjects were assessed with 1 day interval to find out intra-rater reliability and the same 30 subjects were examined independently on the same day by two therapists to get the inter-rater reliability. Intra-class correlation coefficients (ICCs) were calculated for reliability statistics.

**Results and Discussions:** AHAbd test demonstrated higher intra-rater reliability that is 0.91 (95% CI: .82-.85) than inter-rater reliability which was 0.83 (95% CI: .82-.95), although both were moderate to good for patients with standing induced low back pain.

**Conclusions:** AHAbd test may prove useful as part of an ergonomic assessment but its level of reliability warrants cautions for its sole use when assessing low back pain induced by prolonged standing.

**KEY WORDS:** AHAbd test, Low back pain, Prolonged standing, Reliability, Teachers, Lumbo-pelvic control.

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## Access this Article online

### Quick Response code



DOI: 10.16965/ijpr.2015.187

### International Journal of Physiotherapy and Research

ISSN 2321- 1822

[www.ijmhr.org/ijpr.html](http://www.ijmhr.org/ijpr.html)

Received: 22-09-2015

Accepted: 01-10-2015

Peer Review: 22-09-2015

Published (O): 11-10-2015

Revised: None

Published (P): 11-10-2015

## INTRODUCTION

Mechanical Low back pain has been shown to be an important health and socio-economic problem of occupational diseases, which plague a large segment of the population in industrialized countries [1]. It is caused by various work related factor which can lead to work incapacity and invalidity [2, 3]. Low back pains signify not only poor quality of life of

individuals, but also decreases labour productivity due to off-work, absenteeism and early retirement [3] additionally, escalating medical costs are associated with LBP.

Over the past decade school teachers, in general, have been demonstrated relative to other occupational groups, to report a high prevalence of LBP [4]. Teaching is carried out under unfavourable circumstances, in which

teachers mobilize their physical, cognitive, and affective capacity to reach teaching production objectives, generating over effort of their psycho-physiologic functions. Work of teachers involves a considerable physical load, established by the educator remaining in the orthostatic position during up to 95% of activities [5].

Recent musculoskeletal researches have proved that muscle co activation of gluteus medius (GM) act as precursor to LBP development during prolonged standing [6, 7, 8, 9]. Based on this finding, Active hip abduction test was developed as a simple screening tool to provide a general assessment of an individual's ability to maintain trunk and pelvis alignment during lower extremity movement when placed in an inherently unstable side lying position. The scoring criteria included two ordinal scale one for participant and other for examiner. The participant is asked to rate the difficulty of the task on 6 point ordinal scale and the examiner rates frontal plane control of the pelvis during active hip abduction on a 4 point ordinal scale, for the examiner rated scale the score from the worse of the 2 sides is used [10].

Although inter-rater and intra-rater reliability of AHAbd test in asymptomatic subjects has already been established [11], it is surprising that its reliability in clinical population is still unknown. If AHAbd test for assessing standing induced LBP is found to be reliable in clinical population, it might allow clinicians to standardize screening and evaluation methods in occupational settings and thereby help in prevention of occurrence of standing induced LBP which would ultimately result in increased work productivity and less economic burden. Therefore, the aim of this study was to assess the reliability of AHAbd test as diagnostic test in teachers with standing induced mechanical LBP.

## MATERIAL AND METHODS

Approval for this research study was granted by the institutional ethical committee of Padmashree institute of physiotherapy. Prior to participation in this study, all subjects and clinician raters completed an informed consent form.

### **Design:** Reliability study

**Participants:** A convenience sample of volunteer subjects- teachers having mechanical low back pain was recruited from the government high schools, Bangalore, India. And 2 Practicing physical therapists working in a similar clinical set up were chosen to find out inter-rater reliability.

**Inclusion criteria for subjects:** Age between 30 to 45 years, both the gender, those who are standing for more than 2 hours, having low back pain during or immediately after prolonged standing task, no previous episode of surgery, fractures, or systemic diseases in spine and lower limbs were included in the study.

**Inclusion criteria for raters:** Holding master's degree in orthopedic physiotherapy, active engagement in clinical practice- preferably musculoskeletal department and having minimum of 3 years of clinical experience.

**Training of raters:** Journal article which described the development of test, scoring criteria of test, scoring sheet and video tutorial of testing and scoring was mailed to both the raters 2 weeks priority. AHAbd test and procedure of performing and rating was demonstrated in person to both raters prior to the day of data collection and any doubt regarding execution and interpretation was solved.

Both the raters were directly called to the schools where the data collection was conducted. Raters were made to stand in such a way that they have a clear view of patient's frontal and axial view of pelvis. They were not allowed to discuss about any participant's score.

The test was assessed simultaneously and independently by two raters to get inter-rater reliability for a total of 30 subjects. And the same 30 subjects were assessed by researcher where the test was repeated after 24 hours to see intra-rater reliability.

**Procedure:** Principals of 9 government high schools were contacted by telephone to request a meeting to explain the study procedure and discuss the feasibility of doing the study in their schools. Following the meeting all the staff members having mechanical LBP during or immediately after prolonged standing task were screened. Demographic details like name, age,

gender, address, phone number was recorded and history was obtained from the subjects eligible for participation, emphasizing on inclusion and exclusion criteria. Participants were requested to return completed consent forms the next day when actual data collection was to happen and they were asked to wear loose fitting clothes the next day, to allow free movement and easy observation of pelvic movement.

To carry out the AHAbd test, subjects were asked to lie on their side, with both of their lower limbs fully extended, in neutral hip rotation and a relaxed ankle position, and their top upper extremity resting on the ribcage and the hand on the abdomen. The investigator then ensured that the subject's shoulder, trunk, and bilateral lower extremities were in alignment. Subjects were not allowed to practice the movement; to avoid the practice effect [12] however, they were passively moved through the AHAbd test prior to each trial so they could get a sense of the movement sequence and range of motion. Investigator provided subjects with the verbal instructions used in a clinical setting: "Please keep your knee straight and raise your top thigh and leg towards the ceiling, keeping them in line with your body, and try not to let your pelvis tip forwards or backwards." Subjects performed the test bilaterally and worse score from two sides was taken into consideration [10].

**Data Analysis:** Statistical analysis was performed by using SPSS software (version 17) compatible with Windows. Alpha value was set at 0.05. Descriptive statistics was used to assess demographic variables and variables of the active hip abduction test. The intra-rater reliability was assessed using the intra-class correlation coefficient. The guidelines used for the interpretation of the ICCs were as follows: 0.00 to 0.25 indicated little if any correlation; 0.26 to 0.49 indicated low correlations; 0.50 to 0.69 indicated moderate correlations; 0.70 to 0.89 indicated high correlations; and 0.90 to 1.00 indicated very high correlation. [11].

## RESULTS

A total of thirty subjects, ranging from 35 to 45 years of age, were assessed during performance of the AHAbd test by 3 raters, two for inter-rater

and one for intra-rater reliability.

The mean of the age of subjects was  $37.50 \pm 2.58$  years (mean  $\pm$  SD). For intra-rater reliability, mean of examiner scale score on day-1 was  $1.57 \pm 0.82$ , and day-2 score was  $1.43 \pm 0.86$ . The minimum value was 0 and maximum value was 3. And for inter-rater reliability, mean of rater-1's score was  $1.03 \pm 0.76$  and rater 2's mean score was  $1.03 \pm 0.81$ .

The intra rater reliability for the examiner-scale was found to be high with ICC value of single measures being 0.915 (95% CI-0.82-0.95) and for average measures being 0.956 (95%CI-0.90-0.97) which was statistically significant ( $p < .0001$ ). The intra rater reliability for the subject-scale was also found to be high with ICC value being 0.933 (95%CI- .86-.96).

**Table 1:** Intra-rater reliability, ICC (single & average), 95% CI & results for examiner scale.

Sl No	Measurement	ICC	95% CI	p value
1	Single Measures	0.915	.829-.959	< 0.0001
2	Average Measures	0.956	.907-.979	< 0.0001

**Table 2:** Inter-rater reliability, ICC (single & average), 95% CI for examiner scale.

Sl No	Measurement	ICC	95% CI	p value
1	Single Measures	0.833	.829-.959	< 0.0001
2	Average Measures	0.909	.907-.979	< 0.0001

## DISCUSSION

Objective of this study was to determine reliability of AHAbd test as diagnostic test in teachers with standing induced OLBP. The results from this study revealed moderate to high inter-rater and intra-rater reliability in physical therapist scoring of the AHAbd test.

Intra-rater reliability for examiner scale was found to be high. In the previous study, done by Alice et al [11], the intra-rater reliability was 0.74 on average, with values for single raters ranging from 0.53 to 0.93. The reason behind this variation in the reliability value could be due to already proven presence of altered muscle contraction in the low-back dysfunction. Present study was done on the LBP subjects, so the loss of frontal plane alignment would be more prominent due to higher altered muscle activation pattern compared to asymptomatic healthy subjects. Several authors supported the idea that, there appears to be increased muscle

activity as either a compensation for or a precipitator of passive subsystem damage and this pre-matured electrical activity itself could be considered as a possible underlying source of recurrent or chronic back pain symptom.

The high inter-rater reliability found in present study could be due to several factors like in this study the subjects with low back pain were tested for whom altered muscle activation pattern is not difficult to notice. Moreover, the screening tool is very simple with very less chance of misinterpretation. And it is possible that high inter-rater reliability in the present study might have been achieved because we included only a small number of experienced (>3years) therapists. The reliability value may be different if more raters are involved, as in the reliability study done on healthy subject by Alice et al, where 16 practicing physical therapist of different experience levels agreed to participate.

The results of this study align well with other reliability studies of observational tests used to assess lumbo-pelvic control during lower limb movement. And in fact these all studies shows that the AHAbd test has higher levels of reliability than many other movement-based tests used in clinical practice [11]. This high reliability along with the high specificity values (0.85) [9] indicates that the test may be useful for ruling in pain development during standing, although the validity has to be established before using it as a screening tool in ergonomic evaluation.

Many authors have suggested that diagnosis based on movement control impairment is considered to be a relevant way to subgroup low back pain patients [13] and outcomes can be improved when this sub-grouping is used to guide treatment decision making. The result of this study suggests that AHAbd test may assist in identifying sub-group of patients at risk of developing standing induced OLBP. Such predictive models would help prevent sickness absence on the individual level and economic costs at community level.

Limitations include convenient technique for sampling which might not have demonstrated the scope of movement patterns typically seen in the backache population. Along with the

standing factors, numerous other factors could also have a role in developing OLBP like psychosocial factor, ergonomical factors and gender as most of the subjects were female, few of them were nulliparous and few were multiparous, but it was out of our scope to control each of the factors. The training session for the raters employed mail conversation and face to face conversation on the day of data collection, so their understanding of the test and scoring would have been affected.

Future studies can be done to measure validity of AHAbd test; also a prospective cohort can be conducted on the asymptomatic individuals who were graded 2 or more on examiner scale, to explore the development of low back pain in those subjects.

## CONCLUSION

The AHAbd test can be considered to be a reliable observational tool for assessing lumbo-pelvic movement patterns in adults having mechanical back pain during/after prolonged standing task. As there is a need to provide effective early interventions that prevents the development of persistent pain and disability, identifying patients at risk for this development is an important step and Predictive models like AHAbd test could be of value in isolating such patients, although validity in clinical population should be established first before using the test for ergonomic evaluation.

**Conflicts of interest:** None

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#### How to cite this article:

Mansi Shah, Pravin Aaron, Subin Solomen. INTER-RATER AND INTRA-RATER RELIABILITY OF ACTIVE HIP ABDUCTION TEST FOR STANDING INDUCED LOW BACK PAIN. *Int J Physiother Res* 2015;3(5):1258-1262. **DOI:** 10.16965/ijpr.2015.187