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Innovation

Development, validity and reliability of a new pressure air biofeedback device (PAB) for measuring isometric extension strength of the lumbar spine

Andries W. Pienaar 🔀 & Justhinus G. Barnard

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# Abstract

This study describes the development of a new portable muscle testing device, using air pressure as a biofeedback and strength testing tool. For this purpose, a pressure air biofeedback device (PAB®) was developed to measure and record the isometric extension strength of the lumbar multifidus muscle in asymptomatic and low back pain (LBP) persons. A total of 42 subjects (age 47.58 years, ±18.58) participated in this study. The validity of PAB® was assessed by comparing a selected measure, air pressure force in millibar (mb), to a standard criterion; calibrated weights in kilograms (kg) during day-to-day tests. Furthermore, clinical trial-to-trial and day-to-day tests of maximum voluntary isometric contraction (MVIC) of L5 lumbar multifidus were done to

compare air pressure force (mb) to electromyography (EMG) in microvolt ( $\mu V$ ) and to measure the reliability of PAB®. A highly significant relationship were found between air pressure output (mb) and calibrated weights (kg). In addition, Pearson correlation calculations showed a significant relationship between PAB® force (mb) and EMG activity ( $\mu V$ ) for all subjects (n = 42) examined, as well as for the asymptomatic group (n = 24). No relationship was detected for the LBP group (n = 18). In terms of lumbar extension strength, we found that asymptomatic subjects were significantly stronger than LBP subjects. The results of the PAB® test differentiated between LBP and asymptomatic subject's lumbar isometric extension strength without any risk to the subjects and also indicate that the lumbar isometric extension test with the new PAB® device is reliable and valid.

## Keywords:

PAB® air pressure isometric strength low back pain (LBP) reliability

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# Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.



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