Journal of Medical Engineering & Technology ›
Volume 41, 2017 - Issue 3

Innovation

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

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Pages 216-222 | Received 10 Sep 2015, Accepted 20 Oct 2016, Published online: 14 Nov 2016

Cite this article https://doi.org/10.1080/03091902.2016.1253794

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 (μV) 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 (μV) 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

Acknowledgements

Sincere appreciation is extended to electronics engineer, Mr Gary Webster (Webtex, Pinetown, South Africa) for the software development of the PAB® device.

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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