

Mobile Functional Reach Test in People Who Suffer Stroke

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Abstract

Background: Postural instability is one of the major complications found in people who survive a stroke. Parameterising the Functional Reach Test (FRT) could be useful in clinical practice and basic research, as this test is a clinically accepted tool (for its simplicity, reliability, economy and portability) to measure the semi-static balance of a subject.

Objective: The aim of this study is to analyse the reliability, sensitivity and specificity in the FRT parameterisation using smartphones for recording kinematic variables in patients who have suffered a stroke. Our hypothesis is that the sensors of smartphones will be reliable instruments for kinematic study of the FRT.

Methods: This is a cross-sectional study of 5 subjects over 65 years who suffered a stroke. During the execution of Functional Reach Test the subjects carried two smartphones, one was placed in the lumbar and the other one in the trunk. After analysing the data obtained in the kinematic registration by the smartphones sensors, a number of direct and indirect variables were obtained. The variables extracted directly from FRT through the smartphones were distance, maximum angular lumbosacral/thoracic displacement, time maximum angular lumbosacral/thoracic displacement, time of return to the initial position and total time. Using this data, speed and acceleration of each of them were calculated. A descriptive analysis of all kinematic outcomes recorded by the two smartphones (trunk and lumbar) was developed and the average range achieved in the FRT. Reliability measures were calculated by analysing the internal consistency of the measures with 95% confidence interval of each outcome variable. The reliability was calculated in the Functional Reach and the outcomes measured by the IS.

Results: The values in the Functional Reach Test obtained in the present study ($2.06 \pm 12.75\text{cm}$) are similar to those obtained in other studies with this population and in the same age range. Intrasubject reliability values observed in the use of smartphones are all located above 0.820, ranging from 0.829 (time B_C lumbar area) and 0.891 (A_B displacement of the trunk). Likewise, the observed intersubject values range from 0.821 (Time B_C lumbar area) and 0.883 (B_C trunk displacement). On the other hand, the reliability of the FRT was 0.987

(0.983-0.992) and 0.983 (0.979-0.989) intersubject and intrasubject respectively.

Conclusions: The main conclusion that can be reached, is that the sensors of the smartphones are a tool with excellent reliability, validity, sensitivity and specificity in the parameterisation of the Functional Reach Test in people who have had a stroke.