8th International Conference

M2D 2019

Mechanics and Materials in Design

Bologna/Italy, 4-6 September 2019

SOCIETÀ EDITRICE ESCULAPIO

ISBN 978-88-9385-155-8

Società Editrice Esculapio s.r.l.
Via Terracini, 30 – 40131 Bologna
www.editrice-esculapio.com – info@editrice-esculapio.it

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TABLE OF CONTENTS

PAPER REF: 085

SURVEY PAPER ON PROTOTYPES APPLIED ON RESISTANCE, STRENGTH AND AGILITY TESTS

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ABSTRACT

The use of mobility, resistance and strength tests in physiotherapy treatments brings a continuous improvement of the conditions of mobility and strength of the individuals. The objective of this study is to carry out a systematic review in the literature on how these tests are performed. The used methodology is a featuring Timed Up and Go, Sit to Stand and Hand Force tests and instrumented chairs were searched in the SciELO and Pub Med databases, among others, from March to January 2019, being selected according to the inclusion or exclusion classification criteria. The results show all the articles that were chosen after the classification approach one of the three tests, or even of instrumented chairs. In all the articles it is noticed the presence of some alteration in the equipment used for the tests or even the inclusion of technologies for the same. In this work, it is concluded that the used of new technologies based on network communication is very important to improve test systems and are beneficial to the quality of results.

Keywords: physiotherapy, mobility test, strength test, instrumented chair.

INTRODUCTION

Biomechanics studies shows how human body performs the movements, that is, the way it reacts to the performance of any physical activity. Posture is known as the position that the body segments relate to each other due to the joint configuration and the state of balance of muscles and bones, for (Bragança, Arezes, Carvalho and Ashdown, 2016), the human being is able to adopt different postures according to the activity that they perform during the day, which, in order to be maintained, requires interactions between all parts of the body, besides the neural and biomechanical regions.

Tests to assess mobility and balance are widely used to control and suggest improvements for posture correction and greater mobility. Among them there are Timed Up and Go (TUG), Sit to Stand (STS) and Hand Force, the latter evaluates only the strength of the hand and not the lower limbs like the others. Each of this tests follow the same principle as the first ones performed with time (Podsiadlo and Richardson, 1991), but Mathias *et al.* (Mathias, Nayak, & Isaacs, 1986), have argued that the tests suffer some variations depending on the purpose of the test, for who is applied and the conditions of the environment that are performed.

This article has as main objective to present a comprehensiveness of how the mobility tests are performed and how the aids of the technologies have brought benefits for the results thus increasing reliability, accuracy and repeatability. The studies considered for this research

should contain the way how the tests are performed or how the sensors are used, or even the instrumented chair that are used for similar physiotherapy tests.

During this work was made a type of questionnaire aimed at health professionals such as physiotherapists, physiatrists, rehabilitation therapists among others, to know if the prototype, that is present in a laboratory on IPB (Polytechnic Institute of Bragança), it is according to the reality when the tests are made.

This work shows the results of the bibliographic searches being a synthesis of the main works found, which have similar systems of the tests or a similar instrumented chair, being performed the SWOT analysis of the existing prototype.

RESULTS AND CONCLUSIONS

The diverse approaches report different means of carrying out the tests. The first techniques to perform these tests were simple, only with a chronometer and a chair in good condition, and with dynamometers in the case of the Hand Force test. More recent research highlights that is necessary to know all the response times for each command of the TUG steps, the time of get up, go to the cone, make the return, return to the chair and sit down again, the same for the STS, the time spent to get up and then sit down again.

Differences were found for the performance of these tests in people with reduced mobility or with some specific disease, such as Alzheimer's and Parkinson's. These people require a longer period of time to respond to commands, therefore, longer test times are considered, when compared to those who do not suffer any disease, also in the Hand Force where the type of force that is intended to be analyzed, can change the method of obtaining or even the equipment to perform the tests.

The evolution of the equipment is also a factor that influences the results. For lower limb mobility tests some more advanced studies employ motion and force sensors, while the most traditional ones use only a chronometer, not considering the variables beyond the total time. In the Hand Force, the more adapted the measurement system to the shape of the hand, the better are the results that the load cells, or the force sensors, will show.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the Polytechnic Institute of Bragança.

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