RELIABILITY OF MYOTEST TESTED BY A COUNTERMOVEMENT JUMP

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Original scientific paper

Abstract

Introduction: The only valid and objective way of assessing muscle strength is measurement with a dynamometer. From the biomechanical aspect, explosive strength is required in athletic sport disciplines like long jumping, high jumping and throwing. Particularly, in technical gestures like take off and landing in vertical jumping. The device "Myotest" (Myotest SA, Sion, Switzerland), enables technology and methodology to assess mentioned gestures. The measurement systems used for the data collection have to possess high sensitivity, reproducibility, transportability, and easiness of use by the coach or athlete. Aims: The main aim of actual research was to determine, by performing Countermovement Jumps (CMJ), whether "Myotest" is a reliable device which allows assessing and discriminate variables Height, Power, Force and Velocity. Methods: The sample of subjects consisted of 10 male students of the Faculty of Sport and Physical Education from Niš, randomly selected, practicing the different sport activities. Subjects performed five vertical jumps (CMJ), at the initial and the final measurement. Results: The value of Cronbach's Alpha coefficient indicates the high reliability of the repeated measurements (0.86). Conclusion: The device "Myotest" is a reliable and easy to handle. Its variety of protocols could be useful to the coaches, the athletes, the physicians and the patients in assessing of the explosive strength, i.e. in planning and implementation of the training and recovery programs.

***Key words**: biomechanics, myotest, countermovement jump*

Introduction

The only valid and objective way of assessing muscle strength is measurement with a dynamometer (Bubanj, S. et al., 2010). Dynamometric evaluation thanks to a physical sensor consists in assessing of force, velocity and power, developed during a movement of a body, accomplished with an under maximum load. This technology gives, regardless if it is applied in the laboratory or training conditions, an innovative approach of muscular evaluation, which interests directly the coaches and the scientists (Jidovtseff et al., 2008). From the biomechanical aspect, explosive strength is required in athletic sport disciplines like long jumping, high jumping and throwing (Bubanj & Branković, 1997).

Particularly, in technical gestures like take off and landing in vertical jumping. The device "Myotest" (Myotest SA, Sion, Switzerland), enables technology and methodology to assess mentioned gestures. The most part of the dynamometers used in the scientific aim are adroitly envisaged, but with a restricted range of the results, a reduced possibility of data exchange and complicated comparative approaches (Jidovtseff et al., 2006; Rahmani et al., 2000; Bosco et al., 1995). Traditionally, the high costs, impracticality and technical demand of "gold standard" devices (force platforms) have negatively impacted their use (University of Connecticat, n.d.). The "Myotest" utilizes the technology of three-dimensional accelerometers (Myotest, n.d.).

Thanks to the use of an accelerometer, this device appears easy to handle in different research conditions and it is not massive (Jidovtseff et al., 2008). In the conditions of the vertical jumping assessing, "Myotest" acts as a passive device, because the motion is made by the subject. Concerning the software, it has several functions: graphic display, data statistical processing, file keeping, file exchange, etc. The measurement systems used for the data collection have to possess high sensitivity, reproducibility, transportability, and easiness of use by the coach or athlete. A quite big amount of devices are available in the market, but there is a lack of validation of these systems (Roig et al., 2008). Concerning some of the previous researches related to explosive strength assessing, it is not clear whether the jump height was defined relative to the height of the whole body center of gravity (CG) in normal standing position or whether to the height of CG at take off (Bubanj, S. et al., 2010). The device Myotest calculates jump height from flight time (Myotest, n.d.). The main aim of actual research was to determine, by performing Countermovement Jumps (CMJ), whether "Myotest" is a reliable device.

Methods

The sample of subjects consisted of 10 male students of the Faculty of Sport and Physical Education from Niš, randomly selected, practicing the different sport activities, age 23.80±1.81 years (Mean±Std.Dev), body height 182.60±4.72 cm

(Mean±Std.Dev), body weight 81.60±6:47 kg (Mean±Std.Dev) and the number of the training sessions per week 3.40±3.37 (Mean±Std.Dev). Among them, there was no injured or ill, which was the main criterion for their inclusion in the research. For the purpose of the explosive strength assessing, a device "Myotest" was used. Subjects performed the vertical jumps, so called Countermovement Jumps (CMJ), and the sample of the variables, processed and mistreated by the device "Myotest" consisted of the: Height (expressed in cm); Power (expressed in W/kg); Force (expressed in N/kg) and Velocity (expressed in cm/s). All subjects agreed with the terms of the research and signed consent for the participation in the project, carried out by the authors and for that occasion specially trained persons in accordance with the Helsinki Declaration. The measurement took place at the Faculty of Sport and Physical Education in Niš. The research comprehended two measurements: the initial (test) and the final (retest). At the initial measurement, subjects applied the warming protocol, and after, they performed CMJ. Two weeks later, at the final measurement and the same conditions, all subjects repeated mentioned protocol. Between two measurements, subjects were instructed, not to apply stretching exercises, in order to avoid possible positive impact (Power et al., 2004; Smith, 1994), or negative impact (La Torre et al., 2010; Taylor et al., 2009; Brandenburg, 2008; Unick et al., 2005; Young & Behm, 2003) of mentioned exercises on the manifestation of the explosive strength. Applied warming protocol included: 800m of smooth run, 4x30m of skip ahead, 4x30m of lateral skip and 4x30m of skip back. Subjects carried a belt around their lower trunk, on which was positioned a wireless device "Myotest" (safely attached to a belt). All subjects performed five vertical jumps (CMJ), in the following way: from the initial position, i.e., normal standing position and the hands placed on the hips, through the flexion in the articulations of the knee up to 90º, after the audio signal of the device, the subjects performed the maximum vertical take-off, and landed with affable flexion (up to 110º) in the articulations of the knee and finally, went back into a starting standing position, while waiting for the new sound signal, when the specified jump technique was repeated. In the case, when the CMJ was not well performed, double audio signal, informed the subject, to repeat properly specified jumping technique. At the end of the protocol, software of the device "Myotest", automatically processed and mistreated the mean values of analyzed variables. For data statistical analysis and interpretation of the results, software "SPSS version 13" was used. Results were expressed through the descriptive statistics, while for establishing of the reliability, the analysis of the reliability was used.

Results

Table 1. Descriptive statistics of the research variables at the initial (I) and final (F) measurement and the Analysis of the reliability

	N	Minimum	Maximum	Mean	Std. Dev.
height_I	10	28.90	52.30	40.71	6.10
power_I	10	49.80	67.50	57.80	4.83
force_I	10	25.00	29.70	27.79	1.46
velocity_I	10	238.00	320.00	281.50	21.31
height_F	10	30.10	53.90	40.92	6.34
power_F	10	47.00	73.00	57.81	7.65
force_F	10	23.80	31.30	28.10	1.98
velocity_F	10	243.00	325.00	282.50	21.85
Valid N (listwise)	10				
Reliability	0.86				

By using the statistical package "SPSS version 13", Cronbach's Alpha coefficient of the reliability of the measurement was calculated. The value of Cronbach's Alpha coefficient indicates the high reliability of the repeated measurements (0.86).

Discussion and conclusion

Reliability is one of the vital characteristics of the testing instrument, but not many researches were conducted in aim to test mentioned characteristic of the device "Myotest". The results of actual research are in accordance with the results of the research conducted by Roig et al. (2008), who determined reliability by assessment of CMJ jumps without arm movement and a pre-stretching of the muscles. Also, the results of the research conducted by the investigators of the Human Performance Laboratory, showed test-retest reliability by assessment of 1RM Squat Force under different time frames (University of Connecticut, n.d.). Research conducted by Haff et al. (n.d.), in aim to determine the reliability of accelerometer based estimates of maximal bench press strength, showed very high intraclass correlation. The device "Myotest" is a reliable and easy to handle. Its variety of protocols could be useful to the coaches, the athletes, the physicians and the patients in assessing of the explosive strength, i.e. in planning and implementation of the training and recovery programs.

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POUZDANOST MYOTEST-A TESTIRANOG POVRATNIM SKOKOM

Sažetak

Uvod: Jedini valjan i objektivan način procjene snage muskulature je mjerenje dinamometrom. S biomehaničkog aspekta, eksplozivna snaga se zahtijeva u atletskim sportskim disciplinama poput skoka u dalj, skoka u vis i bacanja. Posebno, u tehničkim pokretima poput odraza i doskoka u vertikalnom skoku. Uređaj „Myotest" (Myotest SA, Sion, Switzerland), omogućuje tehnologiju i metodologiju ocjene spomenutih kretanja. Mjerni sustav koji se koristi za prikupljanje podataka treba posjedovati visoku osjetljivost, ponovljivost, mogućnost prenošenja, kao i jednostavnost uporabe od strane trenera ili sportaša. Ciljevi: Glavni cilj aktualnog istraživanja bio je utvrđivanje, uz izvođenje Povratnog skoka (CMJ), je li „Myotest" pouzdan uređaj koji omogućava ocjenu i razlikovanje Visine, Snage, Sile i Brzine. Metode: Uzorak subjekata sastojao se od 10 studenata muškog spola Fakulteta sporta i tjelesnog odgoja u Nišu, slučajno izabranih, koji e bave različitim sportskim aktivnostima. Ispitanici su izveli pet vertikalnih skokova (CMJ), u inicijalnom i finalnom mjerenju. Rezultati: Vrijednost Cronbach's Alpha koeficijenta pokazuje visoku pouzdanost ponovljenih mjerenja (0.86). Zaključak: Uređaj "Myotest" je pouzdan i jednostavan za korištenje. Varijacije njegovih protkola mogu biti korisne trenerima, sportašima, liječnicima i pacijentima u ocjeni eksplozivne snage, ali i u planiranju i implementaciji programa trenninga i oporavka.

***Ključne riječi**: biomehanika, myotest, povratni skok*

Received: July 29, 2010
Accepted: December 20, 2010
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