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RELIABILITY OF A LOADED COUNTERMOVEMENT JUMP PERFORMANCE USING THE CHRONOJUMP-BOSCOSYSTEM

ZANESLJIVOST IZVEDBE SKOKA Z NASPROTNIM GIBANJEM Z DODATNIM BREMENOM PRI UPORABI SISTEMA CHRONOJUMP-BOSCOSYSTEM

ABSTRACT

The purpose of this study was to establish the reliability of a loaded countermovement jump using the Chronojump-Boscosystem. Fifteen male college sports science and physical education major students (age: 20.0 ± 2.4 yrs; height: 162.4 ± 27.3 cm; weight: 74.5 ± 28.6 kg) volunteered to participate in the study. They performed two trials of a 20-kg loaded countermovement jump for two days separated by a one-day rest interval. The best trial for each session was kept for analysis. Reliability was determined using interclass correlation (ICC), typical error (TE), coefficient of variation (%CV) and smallest worthwhile change (SWC). The results revealed that the loaded countermovement jump posted the following values: 1.) ICC = 0.86; 2.) TE = 0.44; 3.) %CV = 6.70; and 4.) SWC = 0.46. In conclusion, a 20-kg loaded countermovement jump performance assessed by the Chronojump-Boscosystem is a reliable test.

Key words: loaded countermovement jump, Chronojump-Boscosystem, open source technology, vertical jump, reliability

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IZVLEČEK

Namen te raziskave je bil ugotoviti zanesljivost skoka z nasprotnim gibanjem z dodatnim bremenom pri uporabi sistema Chronojump-Bosco. V raziskavi je prostovoljno sodelovalo petnajst moških – študentov študijske smeri športna znanost in telesna vzgoja (starost: 20,0 ± 2,4 let; višina: 162,4 ± 27,3 cm; teža: 74,5 ± 28,6 kg). V dveh dnevih so opravili dva preizkusa izvedbe skokov z nasprotnim gibanjem z dodatnim 20-kilogramskim bremenom, pri čemer so imeli med preizkusoma enodnevni premor. Najboljše rezultate preizkusov obeh dni smo uporabili v analizi. Zanesljivost smo določili z interklasno korelacijo (ICC), značilno napako (TE), koeficientom variacije (% CV) in najmanjšo uporabno spremembo (SWC). Rezultati so pokazali naslednje vrednosti pri skoku z nasprotnim gibanjem z dodatnim bremenom: 1.) ICC = 0,86; 2.) TE = 0,44; 3.) % CV = 6,70; in 4.) SWC = 0,46. Ocenjevanje izvedbe skoka z nasprotnim gibanjem z dodatnim 20-kilogramskim bremenom s pomočjo sistema Chronojump-Bosco je zanesljivo.

Ključne besede: skok z nasprotnim gibanjem z dodatnim bremenom, sistem Chronojump-Boscosystem, odprtokodna tehnologija, vertikalni skok, zanesljivost

INTRODUCTION

The Chronojump-Boscosystem is a low-cost, open source and validated technology that may aid coaches and practitioners in performance monitoring and training (De Blas, 2012; González, González, & Gómez-Arribas, 2003). One feature of the Chronojump-Boscosystem is its ability to detect leg power from electrical changes using a contact mat system. A loaded countermovement jump (LCMJ) is commonly used in studies detecting mechanical adaptations to load-related stimulus (Clark, Bryant, & Reaburn, 2006; Mcbride, Triplett-Mcbride, Davie, & Newton, 2002; Mcbride, Nimphius, & Erickson, 2005). To the researchers' knowledge, no reliability study has been published using the LCMJ operating with open-source technology. Thus, the purpose of this study was to establish the reliability of a LCMJ utilising the Chronojump-Boscosystem.

METHODS

Participants

Fifteen male college sports science and physical education student majors (age: 20.0 ± 2.4 yrs; height: 162.4 ± 27.3 cm; weight: 74.5 ± 28.6 kg) from the College of Human Kinetics, University of the Philippines were recruited in the study. Inclusion/exclusion criteria included a 72 hour cessation from any form of strenuous activity and the absence of upper and lower body extremity injury. The students read and signed an informed consent with procedures of experimentation in accordance with the Declaration of Helsinki for human testing.

Procedures

The study consisted of two sessions separated by a one-day rest interval in between sessions. The experimentation was administered by a trained tester at the exercise science laboratory of the College of Human Kinetics, University of the Philippines (8:30-10:00 AM and 1:00 – 2:30 PM). During the first session, anthropometrics and demographics were obtained from the subjects. The subjects then performed a standardised warm-up protocol which consisted of 5 minutes of light jogging intensity with Borg's Perceived Exertion rating of less than 11 (Borg, 1982). This was followed by the listed dynamic-static stretching exercises performed in 1 set of 5 repetitions per side: 1) lunge with reach; 2) reverse lunge with a twist; 3) leg swing, leg crossover to toe touch; and 4) standing knee hug to Quadricep stretch. A two-minute active rest was allowed prior to the first LCMJ trial. In the LCMJ performance, the subjects performed the countermovement jump with a 20 kg bar placed across their shoulders. The subjects were requested to jump as high as possible while keeping the bar on their shoulders during the jump. Two trials of LCMJ were conducted. An additional trial was carried out in case a faulty jump execution was detected. On day two, the participants performed similar warm-up and LCMJ procedures as on day 1. The best LCMJ scores from both sessions were utilised for the analyses. LCMJ performance was based on the jump height (cm) which was measured using the Chronojump-Boscosystem. The Chronojump-Boscosystem in this study consisted of free downloadable from the Internet (Chronojump-Boscosystem Software, Spain), open hardware (Chronopic 3, Chronojump-Boscosystem, Spain) and two 30.48 x 30.48 cm home-made contact platforms. Chronopic 3 was set at a 50 ms contact time detection setting. Jump height was estimated through the flight time detected from the contact platforms (Bosco, Luhtanen, & Komi, 1983).

Analyses

The data are reported as a mean, standard deviation. Microsoft Excel® 2003 (Microsoft, Redmond, USA) was used to derive the intraclass correlation coefficient (ICC), typical error (TE), and coefficient of variation (%CV) (Hopkins, 2000a). The smallest worthwhile change (SWC) was computed from the formula: 0.2 x between-participant standard deviation (Batterham & Hopkins, 2006).

RESULTS

Age, anthropmetrics, Day 1 and Day 2 LCMJ performances, ICC, TE, %CV and SWC are presented in Table 1. The ICC for LCMJ on Day 1 and Day 2 was 0.86. TE was 0.44. %CV and SWC were 6.70 and 0.46, respectively.

Table 1. Age, Anthropmetrics and Jump Performance of the Participants

Variable	
Age (yrs)	20.0 ± 2.4
Height (cm)	162.4 ± 27.3
Weight (kg)	74.5 ± 28.6
LCMJ Day 1 (cm)	27.8 ± 4.80
LCMJ Day 2 (cm)	27.8 ± 4.40
ICC	0.86
TE	0.44
%CV	6.70
SWC	0.46

Legend: LCMJ – loaded counter movement jump; ICC – interclass correlation; TE - typical error, %CV – coefficient of variation; SWC – smallest worthwhile change

DISCUSSION

The purpose of this study was to establish the reliability of a loaded countermovement jump performance using the Chronojump-Boscosystem. Establishing the reliability of the test would help in attaining the repeatability of results in monitoring an improvement in performance or for talent identification (Hopkins, 2000b; Cormack, Newton, McGuigan, & Doyle, 2008). It has been suggested that an ICC > .80 and %CV < 10 are 'acceptable' measures of test reliability (Atkinson, Nevill, & Edwards, 1999; Clark et al., 2006). In this study, the ICC was determined (0.86). The ICC value of the LCMJ in this study is considered as moderate to high. Also, %CV was 6.7 which falls within the 'good' %CV reference for test reliability. Lastly, TE was less than SWC. Hopkins (2004) suggested that one of the 'ideal' bases for reliability is when TE < SWC. In conclusion, the LCMJ is a reliable test according to the Chronjump-Boscosystem.

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