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Assessing the key physical capabilities in striking combat sports: reliability and reproducibility of a new test.

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INTRODUCTION:

The rules and technical aspects of combat sports make it difficult to determine key performance indicators [1]. It is well established that striking actions require a combination of explosive strength, power, and speed alongside a well-developed cardiovascular system, particularly the anaerobic system [1, 2]. The Force-Velocity-Power (FVP) and anaerobic assessments used in combat sports were generally upper or lower body dominant [2]. In striking combat sports, the Landmine Punch Exercise (LPE) has a high transfer potential due to similarities with striking skills. Therefore, the main focus of this study was to investigate the reliability and reproducibility of the LPE as a specific neuromuscular and anaerobic assessment for striking combat sports. The second purpose was to compare the FVP obtained by the multiple-points (MP) versus the two-points (TP) method.

METHODS:

Ten high-level boxers performed three trials consisting of FVP (both TP and MP methods) and fatigue tests using the LPE. The FVP test consisted of incremental loading (20%, 30%, 40%, and 50% of the body mass) using ballistic bar throws (i.e. LPE). After performing FVP profiles, the load eliciting Pmax was applied for a 30-s all-out LPE effort. A 3D accelerometer (Microgate Gyko Repower, Bolzano, Italy) was used to determine biomechanical variables from the assessments: maximal theoretical force (F0), velocity (V0), power (Pmax), the slope of the relationship (Sfv), peak power (Ppeak), mean power (Pmean), minimal power (Pmin) and a fatigue index (FI%). Analyses of variance and reliability plus reproducibility were tested through intraclass correlation coefficients (ICCs), coefficients of variation (CVs), effect size (ES), and coefficient of correlation while comparisons between the TP and the MP methods were carried out through, paired t-tests, ES, coefficient of correlation and Bland-Altman plots.

RESULTS:

Analyses of variance and paired t-tests didn't reveal significant differences for test-retest sessions and methods comparisons, respectively. This was associated with high within-subject intra-session and inter-session reliability and reproducibility, found for both FVP and fatigue test parameters (CVs<10%, ICCs>0.67, ES < 0.2 for F0, V0, Pmax, Sfv, Ppeak, Pmean, Pmin and FI% and $r > 0.88$) [3, 4]. In addition, the TP and MP methods showed high validity and agreement (F0: $r = 0.88$, V0: $r = 0.95$, Pmax: $r = 0.96$, Sfv: $r = 0.93$ and all ES were <0.11).

CONCLUSION:

The novel LPE test presented in this pilot study is a highly reproducible tool for evaluating both neuromuscular and anaerobic components specific to the discipline. Alongside that main result, athletes and coaches may preferentially use the TP method to reduce fatigue and the time required to perform the testing procedure and to better understand striking performance in combat sports.

1. Barley et al. (2019) 2. Chabeene et al. (2012) 3. Hopkins et al. (2009) 4. Lenetsky et al. (2018)

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