This is the submitted version of a paper presented at 22nd Annual Congress of the European College of Sport Science, Essen, Germany, 5th-8th July, 2017.

Citation for the original published paper:


N.B. When citing this work, cite the original published paper.

Permanent link to this version:
http://urn.kb.se/resolve?urn=urn:nbn:se:hh:diva-35129
Construct validity and test-retest reliability of the force-velocity profile in a golf specific rotation movement

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Introduction: Assessing the isoinertial force-velocity (F-V) and power relationships has previously been found valuable to assist the understanding of the underlying mechanisms responsible for maximal power output. Multiple studies have investigated the F-V profile in the lower body, however, few studies have investigated F-V profiling in rotational movements, in particular, the golf swing. There is a need for isoinertial strength assessment protocols which can relate to final swing performance. The specific objective of the study was to investigate if measurements of force, velocity, and power using five different loads in a golf specific rotational movement are valid and reliable.

Methods: 12 elite golfers (handicap - 1.5±1.2) 8 men and 4 women performed a golf relevant rotational movement using five different loads (2, 6, 10, 14, and18 kg) in a motorised cable machine (1080 Motion AB, Sweden), measuring exercise peak force (PF), peak velocity (PV), and peak power (PP). In addition, normal-swing driver clubhead speed (CHSnor), and maximum clubhead speed (CHSmax) was measured using radar (Trackman, Denmark). The best of three trials for CHSnor, CHSmax, and the golf rotation was used for further analysis. Test-retest occasions were separated by 7-14 days. Statistical analysis: Change in mean (CIM) individual inter-session coefficient of variation (CV) and intraclass correlation coefficient (ICC) was used to analyze test-retest reliability, a spearman's correlation between the rotation output variables and the CHS was used to assess construct validity. For reliability, an ICC of >0.70 was considered acceptable and results for correlation were considered excellent (≥0.90), good (0.75–0.89), moderate (0.50–0.74), poor (<0.50).was considered to be acceptable. Results: PF, PV, and PP for all of the five loads, apart from PP with 2 kg (CIM=12.2%, CV=14.1%, & ICC= 0.29) and PP with 18kg (CIM=8.6%, CV=19.1%, & ICC= 0.93), showed good reliability (CIM= 0.05-3.6%, CV=1.4-8.5%, & ICC= 0.84-0.97). PF (r=0.780-0.89 & 0.75-0.88), PV (r=0.76-0.86 & 0.78-0.85), and PP (r=0.75-0.84 & 0.76-0.85) for all loads had statistically significant strong correlations with both CHSnor and CHSmax respectively, apart from PF at 2kg (r=0.33). The average day to day variation among all loads for PF, PV and PP were 17.9 ±13.7 N, 0.30 ± 0.23 m/s, and 135.9 ± 128.1 W respectively. Greatest PP was achieved with the 14 kg load, although PP at 6, 10, and 14kg only differed by 90 W (8%) between these loads. Discussion: Isoinertial force-velocity-power profiling in high-level golfers can be assessed after a familiarization session. The strongest correlation among the rotational tests and CHS was between PF at 10 kg and CHSnor (r=0.89) and in general, the PF, PV, and PP variables had strong relationship with both CHSnor and CHSmax. Such profiling may provide valuable information insight into the neuromuscular capabilities of high-level golfers and may be used to monitor specific training adaptations.