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Reliability and Validity of the Countermovement Jump Height on the Polar Vantage V2 sports watch with high performance female artistic gymnasts

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INTRODUCTION:
Under controlled measurements regarding countermovement and peak power (PP), the jump height of the Countermovement Jump (CMJ) may be an appropriate parameter to evaluate neuromuscular fatigue. It is proven to indicate both acute as well as accumulated fatigue based on changes to baseline values (1, 2, 3). Polar Electro conceived the "Leg-Recovery-Test" on their Vantage V2 sports watch (V2) to track changes in jump heights and consequently generate statements about fatigue of the lower extremities. This study aimed to evaluate the validity and reliability of the described test in comparison with a force plate (FP), to make further assumptions about neuromuscular functions.

METHODS:
Ten elite female artistic gymnasts (age: 17.2 ± 2.5 y) performed the "Leg-Recovery-Test" (three consecutive CMJs) three days in a row on a portable FP (CYCESS medical, SPSport, Österreich) wearing the V2. In the middle and at the end of the study period, two additional days of CMJ testing took place for validity calculations. Regression model of Hopkins was used along with the coefficient of determination (r2) to test the validity against the FP (4). Intra-class correlation coefficient (ICC) and coefficient of variation (CV) were calculated for intra-session and inter-session reliability as well as the standard error of measurement (SEM) for the latter one (2, 4, 5).

RESULTS:
After applying the regression model on vertical jump heights of the V2, about 78% could be determined by the FP (r2 = .78; CV = 4.70%) (4). Inter-session reliability displayed high values within the V2: ICC = .82; CV = 4.8%; SEM = 1.95 cm and the FP: ICC = .88; CV = 3.9%; SEM = 1.62 cm. Reliability of single trials (intra-session) of the V2 was low to moderate: ICC = .58, CV = 8.7% (Day1); ICC = .68, CV= 6.9% (Day2) and ICC = .43, CV = 9.0% (Day3), but high to very high for the FP: ICC = .87, CV = 4.3% (Day1); ICC = .93, CV = 3.4% (Day2) and ICC = .86, CV = 4.1% (Day3).

CONCLUSION:
In highly trained gymnasts the "Leg-Recovery-Test" demonstrated acceptable validity and reliability within the mean CMJ height of three consecutive jumps, but less within single trials. Compared to existing literature, CVs of the FP were within the expected values of < 4% (3) and means of V2 fell into expectations around 6% as well (6). Hence, assuming familiarity of execution of CMJ, the V2 can be partly considered as plausible tool for practicable daily use to assess changes in jump heights, that could be further investigated for relationships with neuromuscular fatigue.

REFERENCES:
1. Oliver et al. (2015) 2. Gathercole et al. (2015) 3. Maier et al. (2016) 4. Hopkins (2007, 2015) 5. Marina and Torrado (2013) 6. McMaster et al. (2014)

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