Comparison of Velocity between an Accelerometer and a Linear Position Transducer during Barbell Back Squat

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PURPOSE: To compare the barbell velocity measurements between two different devices at a variety of loads during the barbell back squat. **METHODS**: 11 men and 7 women completed a body composition assessment followed by a 1-repetition maximum (1RM) test on the barbell back squat. After 48 hours, subjects completed 7 sets of barbell back squat at submaximal loads in a randomized order. Subjects completed 5 repetitions per set at every 10% of 1RM from 30-80% of 1RM, and 3 repetitions at 90% of 1RM. A rest period of 3-5 minutes was provided between each set. Average velocity (AV) was assessed during each repetition using an accelerometer (ACC) and linear position transducer (LPT) attached to the barbell. Average AV was calculated for each set and device. All barbell back squat testing was performed on a power rack with calibrated weight plates and was overseen by a Certified Strength and Conditioning Specialist to ensure safety and proper form. Subjects were instructed to complete each repetition "as fast as possible". The differences in velocity between the ACC and LPT at each of the 7 loads were assessed using a 2×7 repeated measures ANOVA with Bonferroni-adjusted post hoc tests. Alpha level was set a $p \leq 0.05$, and all data are presented as mean±standard deviation. **RESULTS**: There was a significant device×load interaction (p=0.005) when comparing average velocity between the ACC and LPT. The LPT recorded significantly greater average velocities than the ACC at 40% (p=0.023, 0.81±0.16 m/s vs 0.78±0.14 m/s), 50% (p=0.027, 0.74±0.15 m/s vs 0.71±0.15 m/s), and 60% (p=0.036, 0.68±0.14 m/s vs 0.65±0.13 m/s) of 1RM. Furthermore, there was a trend (p=0.059) for the LPT (0.87±0.20 m/s) to record a faster average velocity then the ACC (0.83±0.19 m/s) at 30% of 1RM. However, at 70%, 80%, and 90% of 1RM the AV recorded by the ACC and LPT were statistically similar. **CONCLUSION**: At lower loads, the velocity of the two devices were significantly different. From 30-60% of 1RM, the LPT recorded a higher AV than ACC. However, from 70-90% of 1RM two devices recorded statistically similar AV. If conducting velocity-based training at loads greater than 70%, either the ACC or LPT can be used as there is no difference in recorded AV; however, at lighter loads there will be differences between the devices.