



# Reliability of Accelerometer vs. Tendo-Unit

Brian Davies, Chris Carroll

Department of Human Kinetics and Applied Health Science  
The Biokinetics Program



## Abstract

**PURPOSE:** Sports like Football, Soccer, Track and Field, Lacrosse, Tennis, Hockey, and Volleyball etc. are characterized by explosive and powerful movements displayed in acute time periods (Sato, et al., 2009). In these sports there are typically very high force absorption/exertion requirements on the body. In preparation for these high force and velocity requirements, it is suggested that athletes perform specific power components required to improve performance and reduce chances of non-contact injuries. Velocity (m/s) is an important variable to equate power, additionally force, combined with velocity of the load are critical measures in power output. The aim of this study is to assess the correlation of an Accelerometer vs. a Tendo-Unit on peak velocity output. Information will be used in future physical preparation to validate correct readings, and will aid in information processing for the preparation specialist in determining training loads.

**METHODS:** 17 male and female participants were used in this study (n=17). Peak velocity in meters per second was assessed on both the Tendo-Unit and 3-D Accelerometer (Myotest, Switzerland). Three back squats to a 90 degree knee flexion were performed by each participant, and each device simultaneously placed on the bar.

**RESULTS:** Tendo-Unit (mean=1.695 m/s ± 0.265) and Accelerometer (mean=1.711 m/s ± 0.264) were analyzed. There was a significant Pearson Product correlation (p=0.01) (r=0.754) between the Tendo-Unit and 3-D Accelerometer. The variance between the two devices was 57% (r<sup>2</sup> = 0.57).

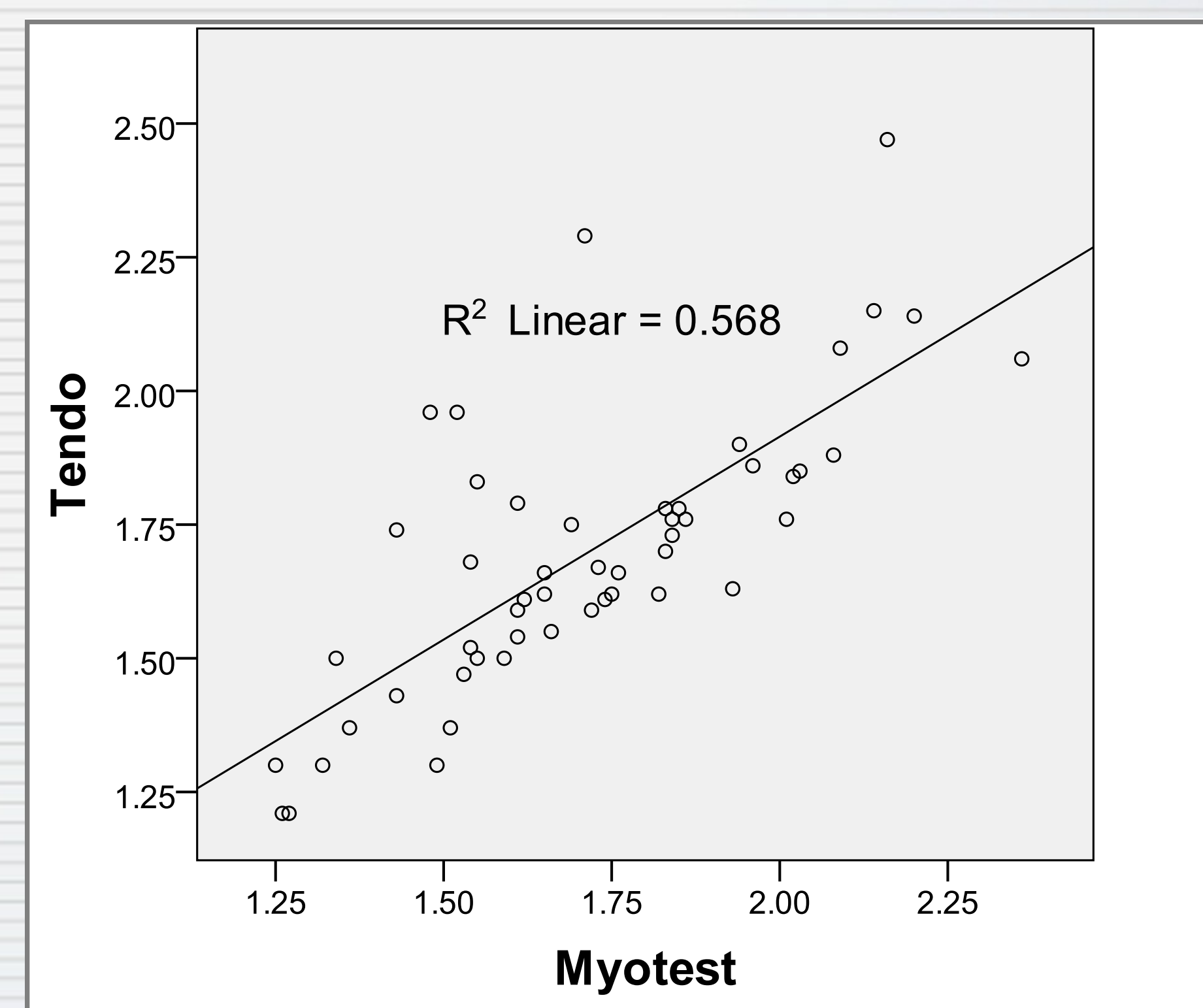
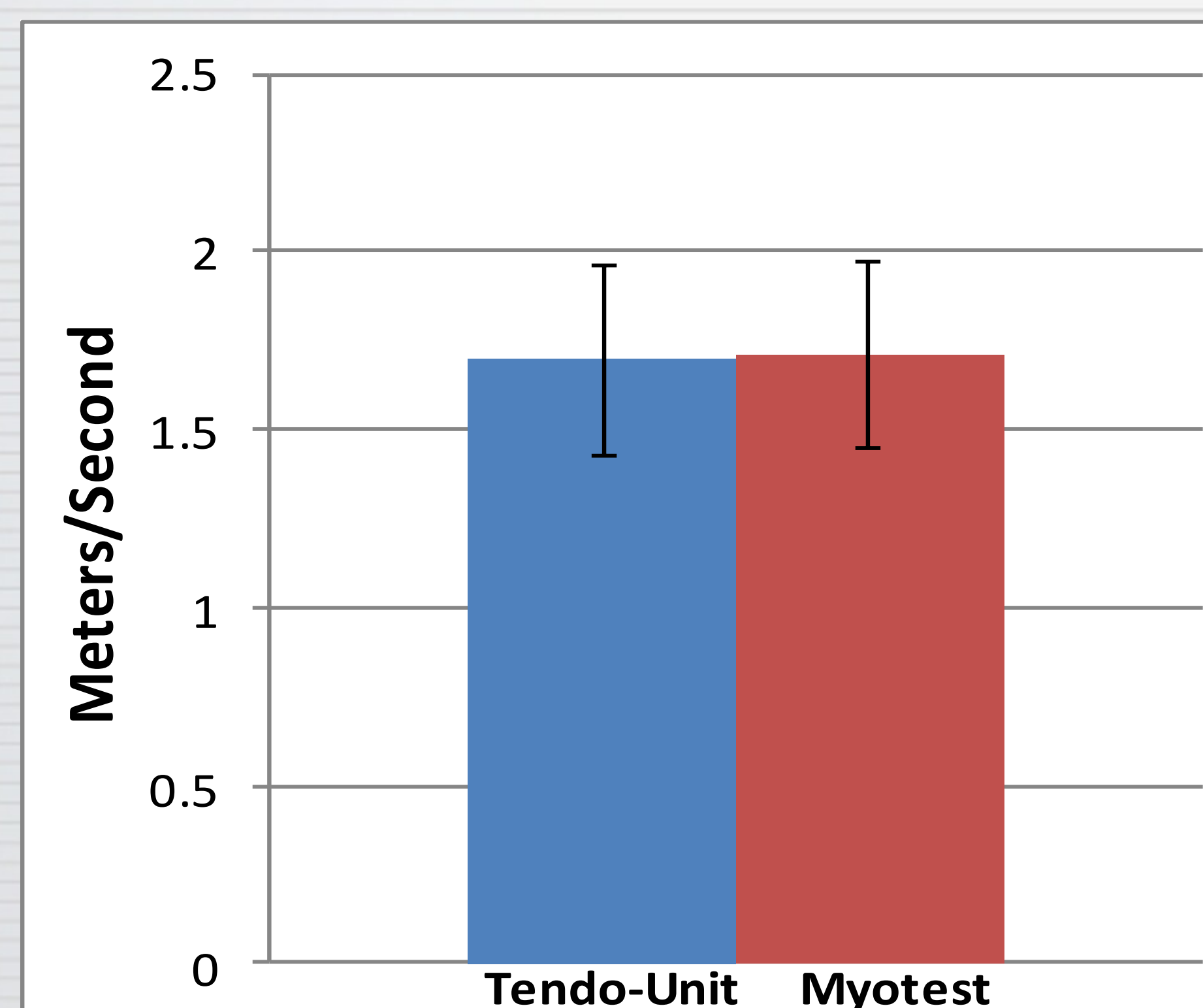
**CONCLUSION:** A significant positive relation between the Tendo-Unit and Accelerometer was found. This provides coaches and trainers the opportunity to use each device to test performance and for auto regulation during training sessions. Additionally, each device could be reliable for regulating fatigue levels and quantifying training variables (peak velocity, average velocity).



## Introduction

Many sports are characterized by explosive and powerful movements displayed in very short time periods. In these sports there are typically very high force absorption/exertion requirements on the body. In preparation for these high force and velocity measures, it is suggested that in the training of these athletes, similar power components are required to improve performance and reduce chances of non-contact injuries. Velocity (m/s) is one of the variables in the equation to equate power, along with force, and therefore the speeds at which the load will be moved are of significant importance for measuring power output. The Accelerometer and Tendo-Unit are both devices that are used to measure such variables, thus the goal of this research was to assess the reliability of the two devices being used interchangeably.

## Comparison of Accelerometer and Tendo-Unit



## Methods

Data was collected from 17 collegiate athletes (Male = 10, Female = 7). Subjects were contacted via email or by word of mouth. A familiarization session was conducted and consent provided. Once cleared to participate, subjects performed 3 successful repetitions of a back squat with the Tendo-Unit and Accelerometer placed on a 45 lb. bar. A successful repetition was regulated by the participant reaching a band at the predetermined height with a 90 degree knee flexion. Each athlete was instructed to move through each phase of the back squat with as much velocity as possible. A rest period of 30 seconds was given between each repetition. If the participant did not reach the prescribed knee flexion they would be instructed to continue with the same protocol until 3 trials were completed successfully.

## Results

Tendo-Unit (mean=1.695 m/s ± 0.265) and Accelerometer (mean=1.711 m/s ± 0.264) were analyzed. There was a significant Pearson Product correlation (p=0.01) (r=0.754) between the Tendo-Unit and 3-D Accelerometer. The variance between the two devices was 57% (r<sup>2</sup> = 0.57).

## Conclusion

The data resulted in a significant Pearson Product correlation (p=0.01) (r=0.754) between the Tendo-Unit and 3-D Accelerometer. This would begin to demonstrate reliability of each device being used complimentary as auto-regulation and for athlete testing, as well as interchangeably when only one device is accessible. The findings also validate the reliability for fatigue regulation and quantifying training variables (peak velocity, average velocity).

## References

- 1 J. L. Nuzzo, J. H. Anning, AND J. M. Scharfenberg . "Intersession reliability of three devices used to measure countermovement vertical jump height." Journal of Strength and Conditioning Research (2011) S68
- 2 R. M. Ruben, H. Saffel, J. L. McCrory, P. Cormie, and G. G. Haff. "Comparison of accelerometer based vertical jump assessments to a linear position transducer plus force plate system." National Strength and Conditioning Association 25 (2011): S37
- 3 K. Sato, S. L. Smith, W. A. Sands. "Validation of an accelerometer for measuring sport performance." National Strength and Conditioning Association 23 (2009): 347