

Peak Velocity During Concentric and Eccentric Muscle Actions in the Peck Deck Exercise in Healthy Females

Palavras-Chave: Resistance Exercise, Velocity-Based Training, Video Analysis

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INTRODUCTION:

Current scientific literature supports the idea that the velocity loss in the concentric muscle action of a resistance exercise can be an indicator of fatigue and proximity to concentric failure (1). This finding is particularly valuable for training models such as Velocity Based Training (VBT), which uses velocity variation throughout repetitions to monitor a repetition itself, a set, or a session (2, 3). Recent research has highlighted VBT as a promising method for monitoring the resistance training load and performance (3, 4).

Additionally, to the best of our knowledge, no previous study investigated velocity variations in specific strength training exercises. This study aims to investigate and compare the variation in peak velocity during both the concentric and eccentric muscle actions of the Peck Deck exercise in healthy females.

METHODOLOGY:

Six healthy females (age: $23,16 \pm 5,41$ yrs; body mas: $61,73 \pm 12,39$ kg; height: $159,55 \pm 7,37$ cm; peck deck 1RM: $39,83 \pm 7,62$ kg) participated in this study. The study consisted of two test visits, with at least 48 hours between them. In the first visit, a direct 1 repetition-maximum (1RM) test was performed for the Peck-Deck exercise (Figure 1). In the second visit, two sets with 75% 1RM were performed until concentric failure with a 4-minute rest interval between sets. The sets were recorded by a smartphone camera in a transverse plane (Figure 2) and later analyzed in the software Kinovea (version 2023.1.1), where the velocity throughout the repetitions was observed (Figure 3). The peak velocity during the concentric and eccentric muscle actions was recorded for both the first repetition (1st) and the repetition at which concentric failure occurred.

The statistical analyses were performed using *jamovi* (version 2.5.6.0). A paired Student's t-test was performed to compare peak velocity between the first and second sets. Since no significant

differences were found [1st repetition concentric action: $t(-0.88) = 5$; $p = 0,416$; 1st repetition eccentric action: $t(-1.37) = 5$; $p = 0,230$; failure repetition concentric action: $t(-0.76) = 5$; $p = 0,483$; failure repetition eccentric action: $t(0.16) = 5$; $p = 0,880$], the mean peak velocity from both sets was used for the paired t-test to compare the first and final repetitions, concentric failure. The level of statistical significance established was $p < 0,05$.

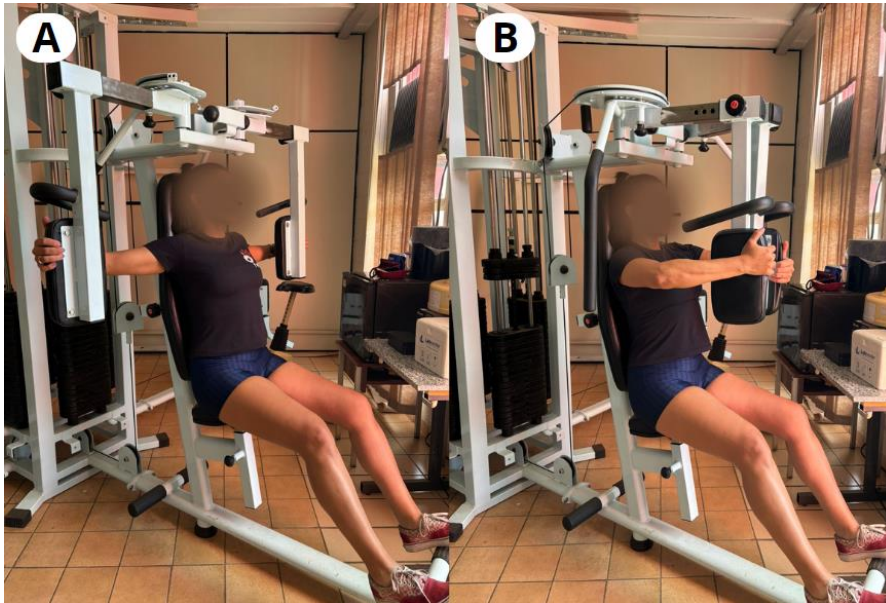


Figure 1. Peck Deck exercise set-up. **A** initial position, **B** final position.



Figure 2. View from transverse plane, where the data was recorded.

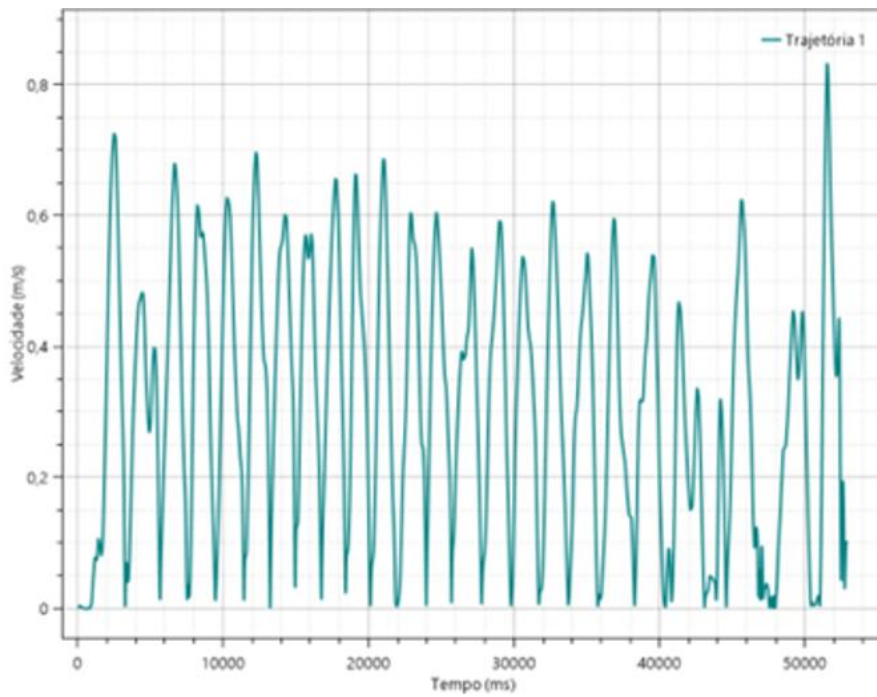


Figure 3. Example of the velocity data during a set performed until concentric failure in Peck Deck exercise.
Source: Author's data.

RESULTS AND DISCUSSION:

A statistically significant difference was found between the peak velocity in the concentric muscle action [$t(5.92) = 11$; $p < 0,001$] of the exercise in the first repetition and the repetition at which failure occurred (Figure 4).

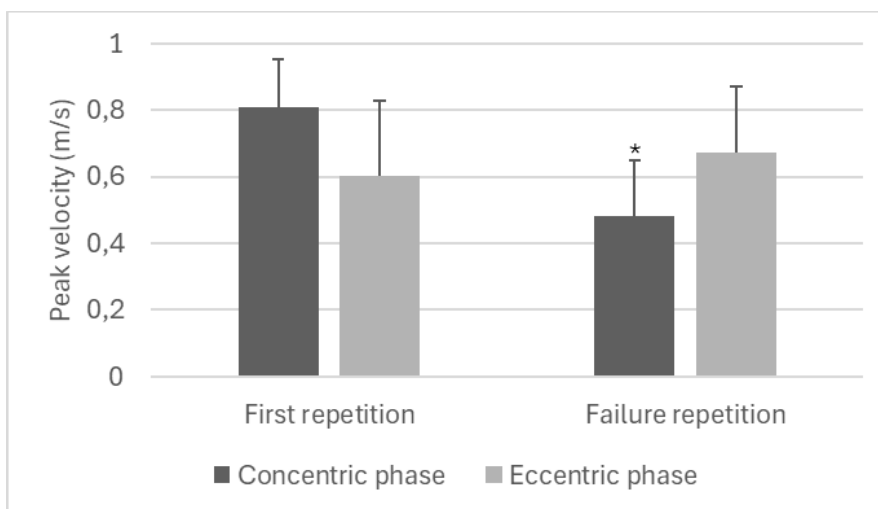


Figure 4. Mean and standard deviation of the 1st repetition and the repetition at which concentric failure occurred.
* Statistically significant differences compared to 1st repetition.

CONCLUSIONS:

In conclusion, our results showed that there is a statistically significant difference in the peak velocity during the concentric muscle action between the first repetition and the repetition at which failure occurred among healthy females. This indicates that as muscular failure approached, the concentric peak velocity decreased significantly suggesting that the decline in peak velocity can be useful for monitoring concentric failure during resistance exercise.

REFERENCES:

1. GONZÁLEZ-BADILLO, Juan; MARQUES, Mário; SÁNCHEZ-MEDINA, Luis. The importance of movement velocity as a measure to control resistance training intensity. *Journal of human kinetics*, v. 29, n. Special-Issue, p. 15-19, 2011.
2. RODRÍGUEZ-ROSELL, David et al. Relationship between velocity loss and repetitions in reserve in the bench press and back squat exercises. *The Journal of Strength & Conditioning Research*, v. 34, n. 9, p. 2537-2547, 2020.
3. GONZÁLEZ-BADILLO, Juan José et al. Velocity loss as a variable for monitoring resistance exercise. *International journal of sports medicine*, v. 38, n. 03, p. 217-225, 2017.
4. JOVANOVIĆ, Mladen; FLANAGAN, Eamonn P. Researched applications of velocity based strength training. *Journal of Australian Strength & Conditioning*, v. 22, n. 2, p. 58-69, 2014.