

# Comparison between different 1RM prediction tests in submaximal load for the usage of a future smartwatch app

Raphael Erni

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## Overview

Research has shown that there is a fundamental importance of quantification of the maximum load that can be lifted through a full range of motion, when it comes to the design of resistance training programs. Furthermore, workout assistants that can track your resistance training through wrist worn devices have shown to be quite accurate when it came to exercise recognition and repetition counting but needed improvement on the integration of a one repetition maximum (1RM) estimation.

## Research Question

The primary aim for this master thesis was to find out which parameters of the load-velocity or reps-to-fatigue relationship formula showed the best accuracy for the 1RM estimation of the exercises barbell bench press, barbell back squat and barbell deadlift. The secondary aim focused on validating the accuracy of a previously developed strength training app and on its functions of exercise recognition, repetition counting and 1RM estimation.

## Methods

A subject group consisting of recreationally trained athletes ( $N = 30$ ) performed 4 sets of up to 10 repetitions with an increasing submaximal load (60 – 80 % of predicted 1RM) for each exercise, wearing an Apple watch with an integrated strength training app and having the GymAware Power Tool attached to the bar to collect data.

## Results

The adapted formula of Jovanović and Flanagan (2014) and Epley (1985) showed the best correlations in all three exercises. Regarding the app's functions, there was an 88.4 % overall correct exercise recognition and an insignificant correlation ( $p = 0.06$ ) between the true and the recognized repetition counting.

## Conclusion

The adapted velocity parameters  $V_{Peak}$  and MVT used by Jovanović and Flanagan (2014) showed the best relationship compared to Epley's (1985) formula and, therefore, propose to be integrated into the strength training app. Moreover, the application showed high accuracy with the exercise recognition and decently reliable results with the repetition counting. Future work has to be put into improving the detection of weight displacement of the Apple Watch and the overall user experience.

**Supervisor:** PD Dr. Silvio Lorenzetti