

# A PRELIMINARY INVESTIGATION INTO THE VALIDITY OF A SUBMAXIMAL PROTOCOL TO PREDICT ONE REPETITION MAXIMUM (1-RM) IN THE BACK SQUAT

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## INTRODUCTION

The one repetition maximum (1-RM) assessment is a well-established, valid, and reliable method of determining an individual's maximal strength (Banyard et al., 2017).

However, the associated time and energy commitment required to obtain a true 1-RM value is considered problematic (Moore & Dorrell 2020).

These concerns have encouraged the development of protocols capable of predicting 1-RM from a range of submaximal efforts, such as that of the Flex laser optic device (Weakley et al., 2020).

While such devices are becoming increasingly popular, the associated validity of these protocols is yet to be fully established.

This is critical for coaches and researchers wishing to adopt such methods as it would provide confidence around the efficacy of these approaches.

## PURPOSE

The purpose of this research study was to determine the validity of the Flex submaximal protocol designed to predict the 1-RM in the full free-weight back squat.

## METHODS

### Participants

15 resistance trained individuals (male: 14; female: 1; age:  $24.8 \pm 5.5$  years; stature:  $178.0 \pm 6.0$  cm; body mass:  $85.0 \pm 10.2$  kg; absolute back squat 1-RM:  $148.5 \pm 42.5$  kg; relative back squat 1-RM:  $1.74 \pm 0.43$ )

### Procedure

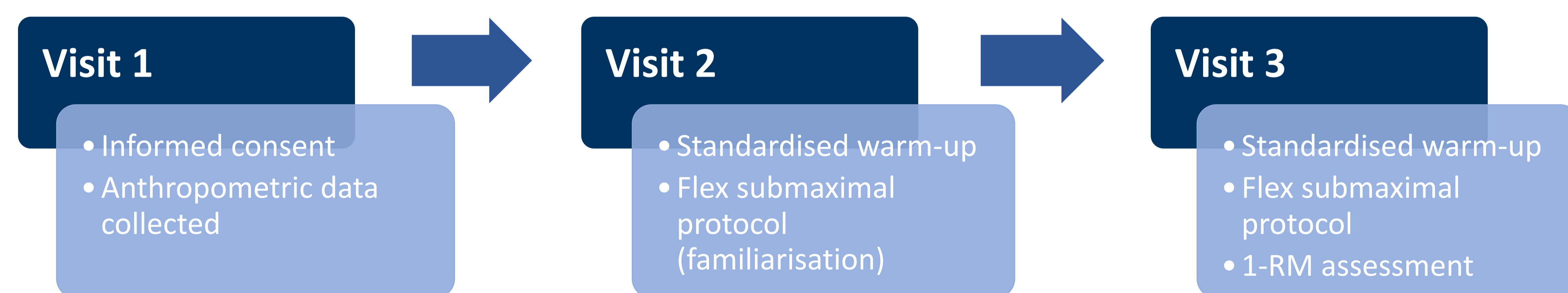


Figure 1. Schematic representation of study design

### Statistical Analysis

- Least products regression and bootstrapped limits to assess linearity and proportional bias.
- Systematic and random error assessed by quantifying the 95% limits of agreement (LOA).

## RESULTS

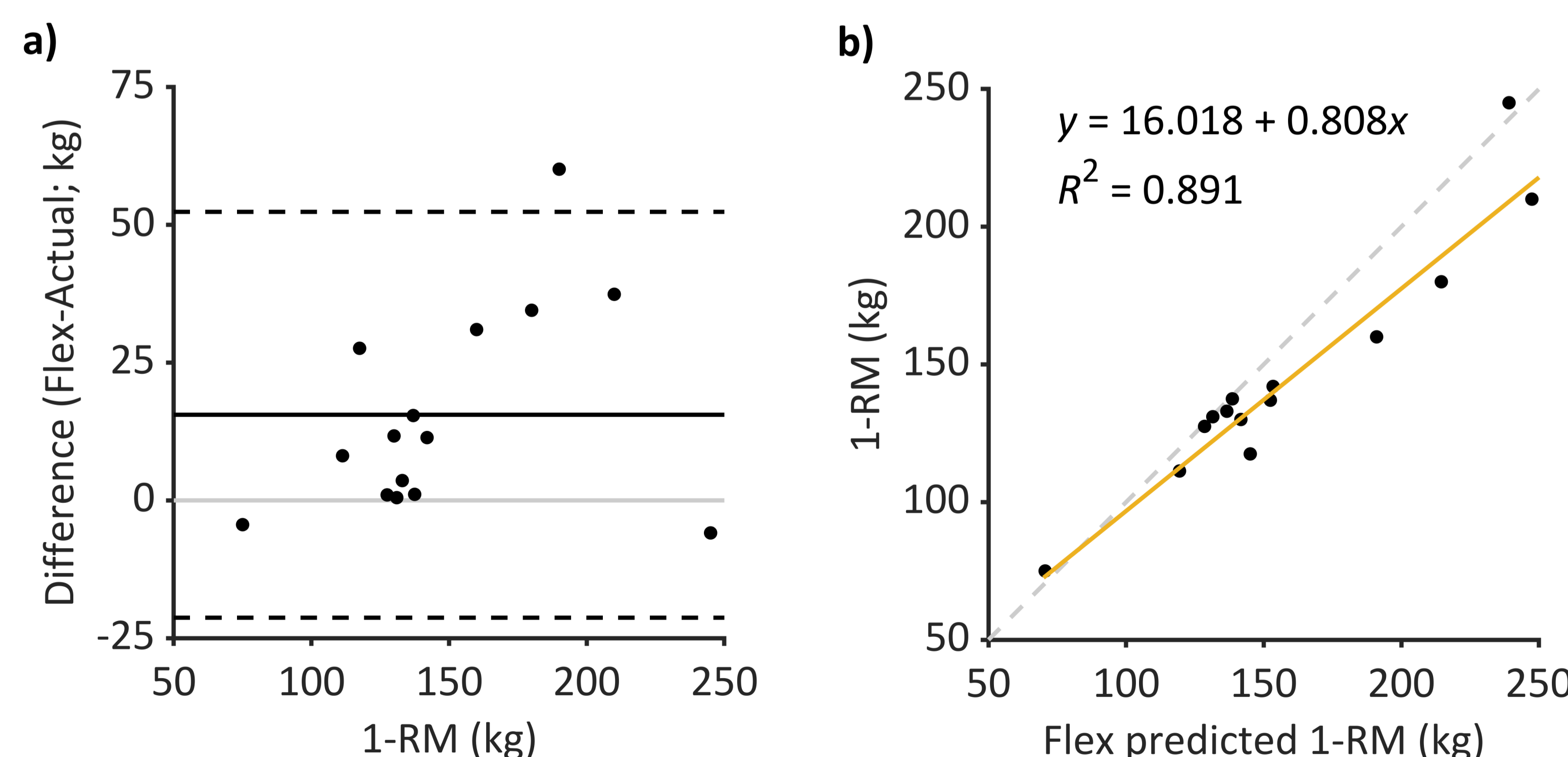


Figure 2a. Bland Altman plot demonstrating systematic and random error of +15.5 kg and 36.8 kg, respectively.

Figure 2b. LPR plot between Flex predicted and actual 1-RM. Y-intercept demonstrates proportional bias is present. Dashed line represents perfect linearity.

## CONCLUSIONS

These findings suggest that whilst there is a degree of correlation between the Flex predicted value and true 1-RM, the Flex does not provide a sufficiently valid measure of 1-RM strength for the free-weight back squat in trained individuals. This is apparent from the general over prediction of 1-RM from the Flex, in addition to the random bias present, which increases in proportion to the maximal strength values

## PRACTICAL APPLICATIONS

Despite the relatively small sample size present within the current data collection, at present, researchers and coaches wishing to collect data on maximal strength levels for the full free-weight back squat should continue to use conventional 1-RM protocols as opposed to the submaximal prediction of the Flex.

## REFERENCES

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