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Effects of Range of Motion and Rest Period on the 1RM Test Results

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ABSTRACT

Effects of Range of Motion and Rest Period on the 1RM Test Results

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1RM strength test results will vary for the same exercise depending on range of motion (ROM) used. Insufficient rest between attempts may also impair performance. **PURPOSE:** to determine the effect of range of motion and recovery time on upper body 1 RM strength testing results. **METHODS:** 10 men and women with experience in weight training, aged 27.7 ± 9.73 y.o., completed a familiarization consisting of a standard bench press 1RM test. On three separate days, they performed a total of 6 combinations each of a 1RM test using 2 ranges of motion (90° partial range, and full range) and 3 breaks (3, 5, and 7 min). Each testing session consisted of two combinations with a 30 min break in between. Each session was preceded by a general 5 min warm-up on a stationary bike and one set of three to five repetitions with 80% of the familiarization 1RM. All subjects performed all combinations in a randomized, repeated-measures design. **RESULTS:** No significant interaction was found between ROM and recovery time ($F = 2.06$ $p = 0.189$). Both ROM ($F = 30.5$, $p < 0.0005$) and recovery time ($F = 8.48$ $p = 0.011$) main effects were significant, with only one pairwise comparison being different: 7 min vs. 5 min ($p = 0.007$). 1RM results below are mean \pm SD.

	3-min rest	5-min rest	7-min rest
90° ROM	64.8 \pm 19.9 kg	62.7 \pm 19.7 kg	65.1 \pm 21.5 kg
Full ROM	57.2 \pm 17.4 kg	56.8 \pm 18.5 kg	57.4 \pm 17.0 kg

CONCLUSIONS: We confirmed that, for bench press, 90° ROM achieves a higher 1RM weight than full ROM. Regardless of ROM, the best results were obtained using a 7-min recovery between attempts. These results are relevant for weight training testing and prescription.

Keywords: strength testing, range of motion, acute recovery.

INTRODUCTION

Tests for the assessment of the maximum force are widely used in the field of physical training and sports field, this always seeking maximum performance. However, the process for determination of 1 repetition maximum has not been fully debugged. Added to this, in various publications consulted there is a high variety of protocols to assess 1RM, obtaining a possible gap in the evaluation itself, as though everyone is looking for maximum strength. There is reason to believe that no research has been concerned with establishing what protocol really achieves peak or maximum results.

Given the need to achieve maximum test load for 1RM and thus measure the maximum force, the purpose of the study was to determine the effect that rest periods and ranges of motion have on the test result of 1RM.

METHODS

Subject characteristics

N=10	AVE \pm STA. DES.
Age (years)	27,7 \pm 9,73
Height (meters)	1,67 \pm 0,06
Weigth (Kg)	66,8 \pm 12,5
1 RM Fam Full ROM	54,89 \pm 17,76
1 RM Fam 90° ROM	60,91 \pm 19,72

- Treatment:** Each subject performed 1RM testing with the 6 combinations obtained between the two ranges of motion (partial and full range) and three rest periods (three, five, seven minutes, R3', R5' and R7').
- Partial ROM Technique** Subject was requested to lower the bar to form a 90 ° angle between the arm and forearm using the elbow as vertex. 2 devices (one on each side) indicated where the participant had to descend to form the angle of 90 °
- Full ROM Technique:** Subject was asked to lower the bar until it touched the chest. As the chest was used as a guide, not the devices were used.
- Statistical Analysis:** To describe all participants, means and standard deviations were calculated for weight, height, body fat percentage, and average 1RM familiarization. An analysis of variance (ANOVA) for repeated measures two-way and 2 X 3 (2 ranges of motion x 3 breaks) to the test results was carried 1RM.

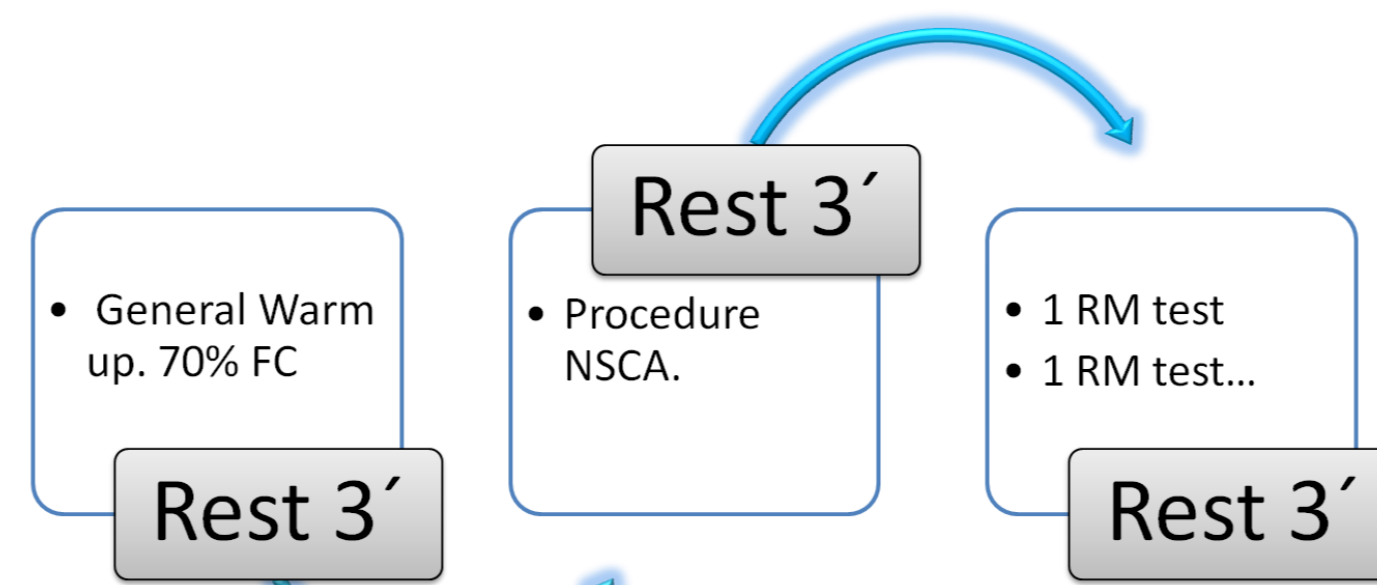
All subjects had experience in endurance training and were informed in detail of the protocols and warned of the risks involved in testing of 1 repetition maximum.

Familiarization. in this session we obtained details of 1RM test for both ranges of motion were obtained and the session was used to standardize the procedure and exercise techniques in all subjects.

PROCEDURES

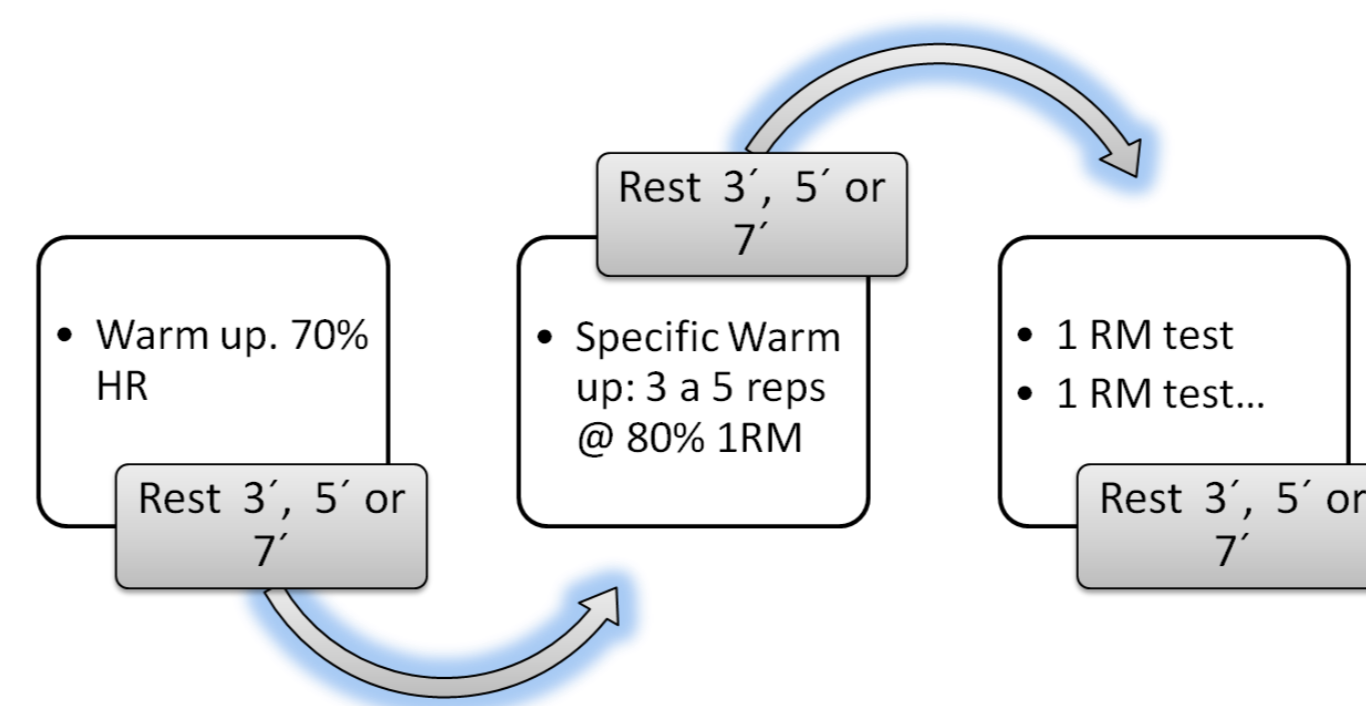


Familiarization



Treatment combinations

	REST		
	Rest 3'	Rest 5'	Rest 7'
Full ROM	REST 3' /RMC	REST 5' /RMC	REST 7' /RMC
Partial ROM	REST 3' /RMP	REST 5' /RMP	REST 7' /RMP



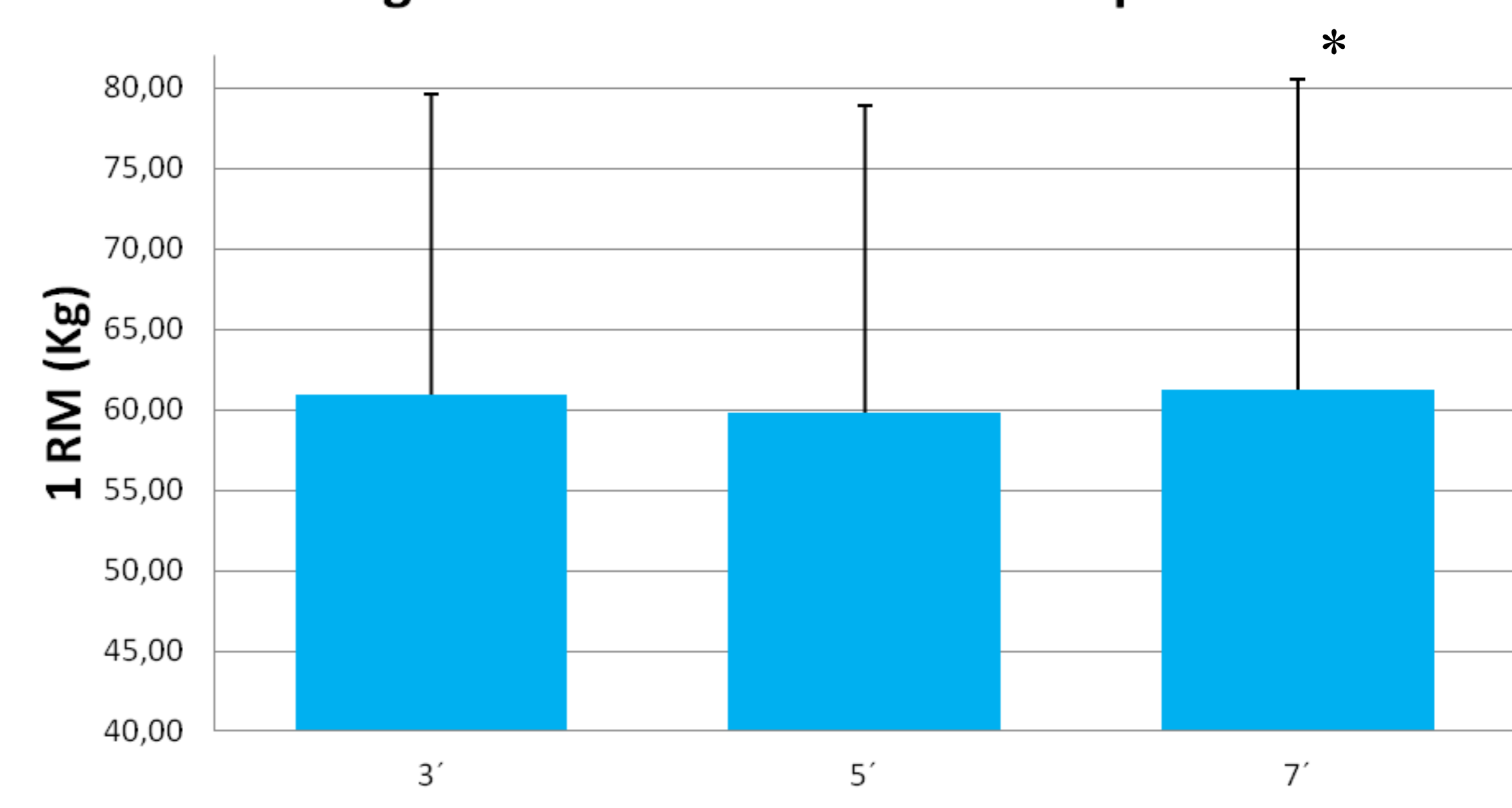
RESULTS

1RM test results according to combination of treatments.

	3-min rest	5-min rest	7-min rest
90° ROM	64.8 \pm 19.9 kg	62.7 \pm 19.7 kg	65.1 \pm 21.5 kg
Full ROM	57.2 \pm 17.4 kg	56.8 \pm 18.5 kg	57.4 \pm 17.0 kg

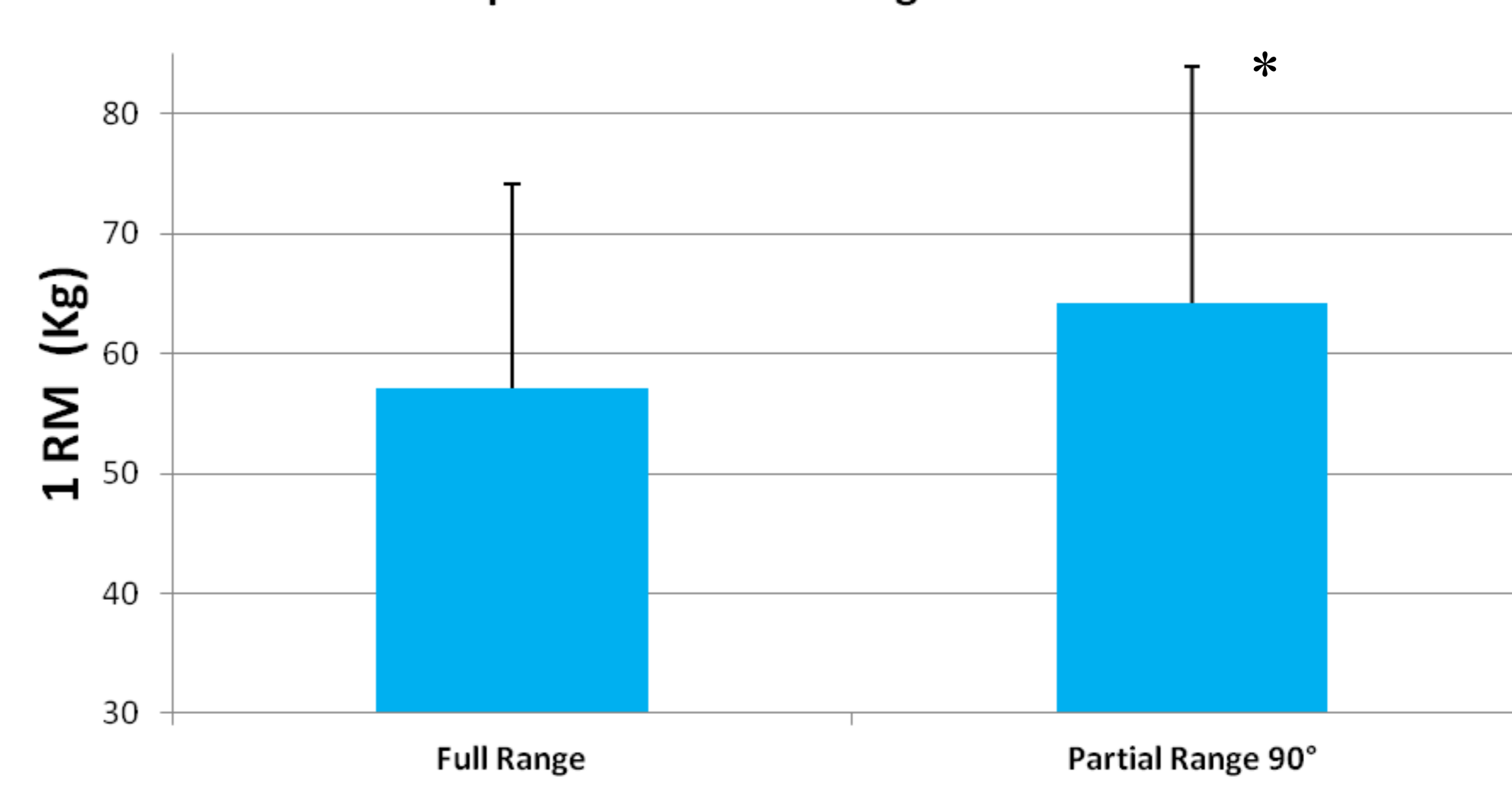
Main Effect; (F=2,06 and p=0.189.)

Averages of 1RM for different rest periods



(*R7 \neq R5, P < 0,007) (F= 8,48, p=0,011)

1RM comparison between angles of execution.



(*Full range \neq partial range , p < 0,0005) (F=30,5 , P < 0.001)

SUMMARY and CONCLUSIONS

- 2 distinct treatments (2 motion ranges and 3 breaks) that generated by combination of six different measurement sessions were applied.
- All subjects completed the six sessions throughout the investigation in a repeated-measures design.
- Significant differences between the two ranges of motion were found, A significant difference was also found between the 5 'and 7' breaks, with the higher values of 1RM achieved with the 7' break.
- These results confirm that there is a significant difference between ranges of motion and the difference is 7.1 kg on average. Users have to define in advance which of the ranges will be used to evaluate the 1RM, as they cannot be used interchangeably.
- The 7' rest between attempts turns out to be best suited for a 1RM test in order to achieve the maximum result.

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