PREDICTING THE 1RM FROM THE LOAD-VELOCITY RELATIONSHIP

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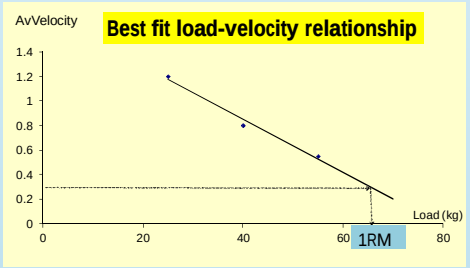
Introduction

Determination of the 1RM => problematic for populations such as the young as well as aged.

Traditional methods = predicting 1RM from performing sub-maximal repetitions to failure (1). The accuracy of this method depends on several parameters such as the number of repetitions, type of exercise, training background and the population used (1). Very recently, authors have suggested to use the load-velocity relationship in order to determine the 1RM (2,3). The aim of the present study was to investigate the ability of such method to predict the 1RM in different strength exercises and with different technological devices.

Material & Methods

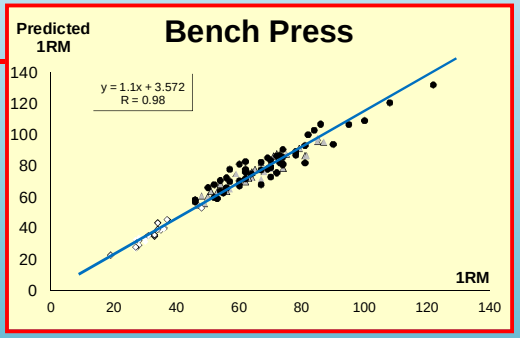
Data from five studies including in their protocol the 1RM determination and the load-velocity relationship profiling were gathered for the present analysis. Bench press, half-squat, horizontal press, leg curl and lat pulldown exercises were selected. A laboratory very accurate inertial dynamometer (4) was used for half-squat and bench press exercise. The Myotest (Myotsest, Switzerland) accelerometer was used for bench press, leg curl, horizontal press and lat pulldown exercises. Each study contain two sessions. The first was used for position standardisation, exercise familiarisation and 1RM determination. In the second session, velocity was measured at three or four increasing loads ranging from 30 to 95% of the 1RM. For each subject and each exercise, the best fit load velocity relationship and equation were determined. Associated parameters such as slope and intercept point on the Y axis were calculated and used for 1RM estimations.



Using Load-Velocityy relationship for 1RM prediction

Results

Exercise	N	Device	F-V Profile	Selected Parameter	1RM	Predicted 1RM	r	SEE
Half Squat	34	LPT+acc	45-60-75-90% 1RM	AvV	128(20)	125(17)	0,76	10,6%
Bench Press	112	LPT+acc	35-50-70-95%1RM	AvV	60 (19)	61 (19)	0,98	7%
Bench Press	15	Myotest	30-60-90%1RM	PeakV	62 (12)	62 (10)	0,82	10%
Horizontal Press	15	Myotest	30-60-90%1RM	PeakV	108 (12)	108 (17)	0,75	10%
Lat Pulldown	15	Myotest	30-60-90%1RM	PeakV	87 (10)	88 (11)	0,62	8%
Leg Curl	15	Myotest	30-60-90%1RM	PeakV	60 (14)	impossible	-	-



Load velocity relationship was unreliable due to the inadaptability of the equipment

Discussion & Conclusion

Bench press results confirm the use of the load-velocity relationship in the 1 RM prediction. Unfortunately, prediction appears to be dependant from selected parameter (peak velocity versus average velocity) device, exercise and equipment. Using average velocity for the load-velocity relationship appears to be more relevant than peak velocity. Myotest device presents the disadvantage to afford only peak measurements. Bench press is more easy to execute than half squat. A consequence is a better reliability in the velocity measurement and in the 1RM prediction. Commercialised machine allowing analytic movement are not adapted to dynamic inertial assessment. Leg curl is the most significant example : for a couple of subjects, it was impossible to estimate the 1RM with the load-velocity relationship. In most cases, this 1RM prediction approach stay as accurate as traditional repetition-to-failure method. However, the load-velocity procedure has the advantage to assess at the same time the muscular velocity, that is a very important component in many sports.

References

[1] Horvat,et al. J Strength Cond Res 17: 324–328, 2003. [2] Jidovtseff et al. J Strength Cond Res 25 : 267–270, 2011 [3] Bosquet et al. J Sport Sc Med **9,** 459-463, 2010. [4] Jidovtseff et al. Isokinetics Exerc Sci 14: 53–62, 2006.