

# Work as an external criterion for intensity strength training versus repetition strength training



FRÖHLICH, M.<sup>1,3</sup>; KLEIN, M.<sup>2</sup>; EMRICH, E.<sup>1</sup>; SCHMIDTBLEICHER, D.<sup>1</sup>

<sup>1</sup>Institute for Sport Sciences, Johann Wolfgang Goethe-University Frankfurt/M, Germany;

<sup>2</sup>Institute for Sport Science, University of Saarland, Germany;

<sup>3</sup>Olympic Training Center, Rhineland-Palatinate/Saarland, Germany

The scientific knowledge among researchers in the field of strength endurance and in methods of strength endurance training is still inconsistent (cf. Carl et al. 1989). On the one hand, the discussion refers to terminology and the problem of definability (the ability to resist fatigue in view of the produced sum of impulses in a given period of time). On the other hand, it refers to the different methods of strength endurance training (Güllich & Schmidtbleicher 1999). In the field of methods, the variation of instructions concerning load and training is noticeable. The opinions between scholars/researchers about intensity and number of repetitions are especially contradictory. Many studies suppose a fixed ratio between intensity and number of repetitions. According to current results of research, this assumption can't be maintained any longer (cf. Marschall & Fröhlich 1999).

The present study investigates the outcome of two different training load settings for strength endurance training. Ten male subjects (31,3 years; 77,8 kg; 179,9 cm ) volunteered for the examination. To determine the reliability and significance a two way ANOVA with repeated measurement was calculated. Experiment 1 was characterized by a constant intensity (50% of the 1-repetition-maximum in each series). Experiment 2 was controlled by an almost constant number of repetitions (25 repetitions in each series, 25-RM). Totally, all the subject had to carry out 6 series with an one minute rest interval between the sets in each of the two settings. The exercise was bench press. The grip width and the distance was measured.

In both experiments, there was a noticeable reduction of the dependent variable (rep. respectively load). In experiment 1 (constant load of the series) the number of repetitions, which the subjects were able to carry out, decreased. Whereas in experiment 2 (constant number of repetitions 25-RM) the load decreased from series to series (see table 1). To compare the results of both experiments, the workloads (as the product of load [N], distance [m] and number of repetitions) were calculated. The study from Fröhlich et al. (2001b) has proven, that the workload is an essential parameter in training guidelines.

In both experiments, the workload decreased from series 1 to series 6, but from series 3 to series 6 this reduction was no more significant. Interestingly enough, the extent of the decrease was different in both experiments (see figure 1a, b). In experiment 1, the workload of series 6 amounted to 25% of the first series, in experiment 2 the workload of series 6 amounted to 50% of series 1. The entire workload (sum of all six series) in experiment 1 was significantly lower than in experiment 2 (see figure 2). Figure 3 show the reduction from series 1 to series 6 in percent.

A final interview showed that the subjects in experiment 2 experienced a higher level of strain than in experiment 1. further studies should examine whether these different levels of strain can be proved by objective parameters (e.g. lactate as a metabolic parameter, EMG as a neurophysiological parameter) (cf. Fröhlich et al. 2001a ).

	series 1	series 2	series 3	series 4	series 5	series 6
rep. by [50%]	30,8 ± 5,3	14,1 ± 4,2	10,0 ± 2,9	9,3 ± 2,7	8,3 ± 2,4	8,0 ± 2,7
load by [25 rep.]	41,2 ± 7,2	32,6 ± 7,7	25,6 ± 7,2	20,0 ± 7,3	18,1 ± 6,0	17,5 ± 6,1

Tab. 1. Number of repetitions by 50% 1-RM vs. load by 25 repetitions over 6 series

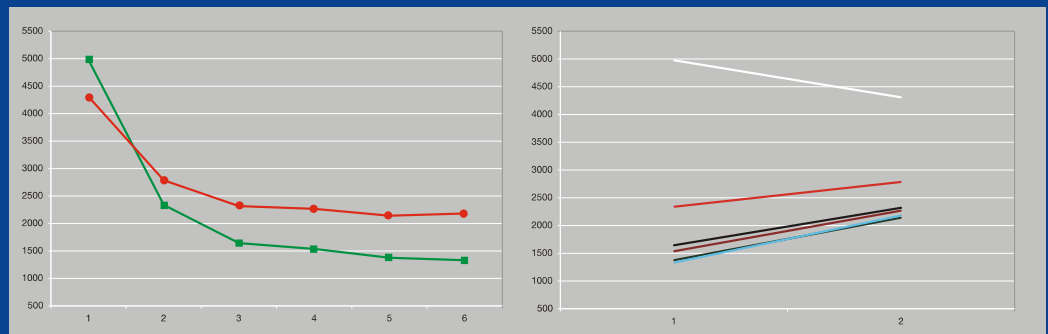


Fig. 1a, b: Workload of sets 1-6 in both experimental settings

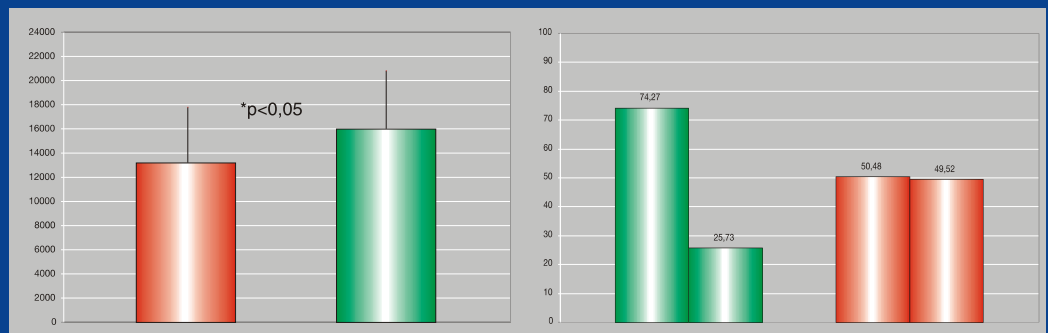


Fig. 2: Totalwork 50% 1-RM vs. 25 repetitions

Fig. 3: Reduction of the work from series 1 to series 6 of both experiments

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