EFFECTS OF SHORT-TERM SLED TOWING AND UNLOADED SPRINT TRAINING ON LEG POWER AND STIFFNESS

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INTRODUCTION: The relationship between stiffness and athletic performance is of great interest to the sport and research communities. Unfortunately, there are no longitudinal studies that have investigated the effects of strength or power training on mechanical stiffness in sprinters. The aim of the study was to examine the effect of resisted and unloaded sprint training programs on sprint time, leg power, and stiffness.

METHODS: Eight female and 14 male athletes (100 m PB: 10.5-11.5 s for men, 12.0-13.0 s for women; > 8 training years) participated. After 3 weeks of standardized training, they were randomly assigned to a resisted (RG) or control (CG) group. They performed the same sprint-specific training program for 4 weeks, which included 2 days of strength training and 2 days of sprints per week: 30 m flying and 50 m maximum intensity. The difference in the RG was the use of sled towing (~8% body mass) for the 30 m fly sprints. The pre and post-tests were: 1) 50 m sprints, where interval times were measured with photocells: 0-15, 15-30, and 30-50 m. A 2D photogrammetric analysis of the run at 40 m from the start was done. Leg and vertical stiffness (*k)* were estimated based on the modelling of the force-time curve from the kinematic variables (Morin *et al*., 2005); 2) Squat jump (90º) (SJ); and 3) countermovement jump (CMJ) on a force plate. A two-way factorial ANOVA with one between-subjects factor (training group) and one within-subjects factor with repeated measures (times in pre and post test) were used to determine the interaction group x time ($p \leq 0.05$).

RESULTS: Power, sprint time, leg/vertical k of each training group are shown in Table 1.

Table 1. Results of the resisted training and control groups in the pre and post test.

		$SJ_{pow/bw}$ ($W \cdot kgf^{-1}$)	$CMJ_{pow/bw}$ ($W \cdot kgf^{-1}$)	$T_{0\text{-}15}$ (s)	$T_{15\text{-}30}$ (s)	$T_{30\text{-}50}$ (s)	k_{leg} ($kN \cdot m^{-1}$)	$k_{vertical}$ ($kN \cdot m^{-1}$)
Resisted	Pre	55.0 ± 7.6	57.3 ± 8.0	2.32 ± 0.17	1.78 ± 0.15	2.28±0.22	13.4±3.1	156.9±37.9
	Post	55.0 ± 7.8	57.6 ± 8.1	2.24 ± 0.11	1.74 ± 0.14*	2.25±0.19	13.2±3.2	155.8±38.2
Control	Pre	54.5 ± 3.4	52.3 ± 6.3	2.36 ± 0.16	1.70 ± 0.10	2.20±0.14	10.7±2.8	125.6±31.6
	Post	51.8 ± 7.7	54.0 ± 7.3	2.26 ± 0.09	1.68 ± 0.09	2.16±0.11*	11.4±3.0	136.9±33.5

Pow/bw- power relative to body weight; T- sprint time in the three phases of the run; k_{leg} and $K_{vertical}$- leg and vertical stiffness while running. *Significantly different in the main effect Time (p<0.05). No significant differences were found in the interaction group x time.

DISCUSSION: The traditional sprint training improved performance in the maximum velocity phase. The resisted training improved performance in the transition phase. No interaction between the group factor and improvements was found, so we cannot determine that the effect was caused by the training. SJ/CMJ power and k were not increased with any of the methods used. The reasons for these results could be the years of training experience, the short duration of the treatment, and the low volume and/or inadequate load of sled training.

CONCLUSION: The effect of the proposed short-term resisted training demonstrated no difference with the unloaded sprint training in the measured variables. The appropriateness and the way of training with sled towing for trained sprinters should be studied more in depth.

REFERENCES:

Morin, J. B., Dalleau, G., Kyrolainen, H., Jeannin, T., and Belli, A. (2005). A simple method for measuring stiffness during running. J. Appl. Biomech., 21, 167-180.