BIOMECHANICAL ANALYSIS OF RESISTED SPRINTING

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INTRODUCTION

Strength and conditioning coaches have a strong interest in helping athletes to improve their speed, agility, strength, and power. Part of speed and conditioning work involves the use of resisted sprinting. The coaches need to know the implications of using methods of incorporating a resistance during speed training. Lockie et al. (2003) has determined that more than 10% of body weight as added resistance can cause changes in hip kinematics during a sprint; however, the effects of using an anterior load on lower limb kinematics were still unknown. Therefore, the purpose of this study was to examine the lower limb kinematics using sled push, weighted vest run, and un-resisted sprint.

METHODS

Five former college and semi pro football players volunteered to participate in the study. Subjects pushed a 9.1 kg sled, ran with a vest with 10% of their body weight, and sprinted over a 13.7 m distance. A standard 2D kinematic analysis was conducted and the running trials were captured at 60 Hz. A one-way repeated measured ANOVA was conducted at $\alpha = 0.05$ and followed by a *t*-test with Bonferroni adjustment when a significant difference was found.

RESULTS AND DISCUSSION

The results of the study showed a significant difference in the hip flexion angle in the sled push compared to the weighted vest and un-resisted sprint. Both knee and ankle angles showed no significant difference among the three training methods. Hip acceleration and velocity were also not significantly different. Since hip velocity and acceleration were unchanged, the sled push may have required greater hip muscle contraction to overcome a smaller angle.

Table 1. Hip flexion at the fourth step of running motion

Conditions	**Mean ± SD°**	***p***
Sled vs. Vest	42.4 ± 3.1vs. 89.2 ± 6.2	0.00*
Sled vs. Sprint	42.4 ± 3.1 vs. 93.9 ± 3.9	0.00*
Sprint vs. Vest	93.9 ±3.9 vs. 89.2 ± 6.2	0.13

**Statistical significant at $p < 0.02$*

SUMMARY

The study concludes that hip flexion is increased when pushing a sled compared to the weighted vest and un-resisted sprint. It is suggested that greater hip muscular strength is needed in the sled pushing method to maintain velocity and acceleration. Strength and conditioning professionals may apply this finding to their speed training program to make an informed decision. Future research is warranted to examine the effects of different mass loads on lower body joint kinematics and kinetics.

REFERENCES

Lockie, R. G., Murphy, A. J., & Spinks, C. D. (2003). Effects of resisted sled towing on sprint kinematics in field sport athletes. *Journal of Strength and Conditioning Research, 17*(4), 760-767.