Exploration of the Benefits of Pre-activation Using Elastic Resistance to Enhance Eccentric Load

Li-I Wang[1,2], Wei-Han Chen[1,2], Yeh-Kai Chen[2]
[1]Dept. Physical Education and Kinesiology, National Dong-Hwa University, Taiwan
[2]Sports Science and Technology Center, College of Hua-Shih College of Education, National Dong-Hwa University, Taiwan
Email: tennis01@gms.ndhu.edu.tw

Summary

The eccentric phase in stretch-shortening cycle (SSC) movements is crucial for performance. This study aimed to apply additional elastic resistance during the eccentric phase of a drop jump (DJ) to enhance the stretching intensity of the SSC mechanism, thereby achieving post-activation potentiation (PAP) benefits. The findings are intended to provide practical insights for sports training professionals t to apply in pre-activity. Twelve male university physical education students participated in this study. Each participant performed DJ from 30 cm drop height (DJ30) under three conditions: no additional resistance, and with 20% and 30%BW elastic resistance. PAP benefits were assessed using sprint and an agility-test. The results indicated that the enhanced eccentric load induced by the elastic resistance did not provide PAP benefits for sprint performance, whereas PAP had a positive impact on agility performance.

Introduction

Selecting appropriate pre-activities to achieve PAP is a crucial component of sports science assisted training. Previous research has indicated that adding elastic resistance during the eccentric phase of a DJ can increase the eccentric load [1]. Therefore, utilizing elastic resistance eccentric loading (EREL) as a pre-activity intervention could potentially induce PAP benefits. This study aims to examine the PAP effects of employing EREL in drop jumps (DJ) and to explore its impact on sprint and agility performance, providing an efficient pre-activity modality.

Methods

Twelve male university physical education students were selected as participants. Each participant randomly performed 2 sets of 5 repetitions of DJ30 without additional load, as well as with 20% and 30% BW elastic resistance (EREL pre-activity), which began 5 minutes after the pre-test. The post-test was conducted 6 minutes after the intervention. The EREL pre-activity refers to past research methods [2], involves the addition of elastic resistance only during the eccentric contraction phase (Figure 1). Participants performed a 10 m sprint, and 5 and 10 m times were recorded. Agility was measured using the 505 test. The time is recorded with electronic photo cells. Statistical analysis was using a repeated-measures *t*-test to compare the pre- and post-test differences. The significance level was set at $\alpha = 0.05$.

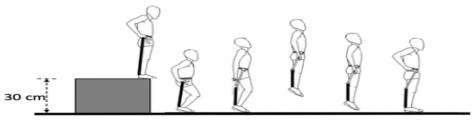

Figure 1: The EREL pre-activity. The subjects released the elastic bands just before the end of downward movement.

Results and Discussion

The findings (Table 1) reveal that performing DJ30 alone does not produce PAP benefits for sprinting or agility performance. However, adding 20% and 30%BW EREL of a DJ30 significantly improves agility performance ($p < 0.05$), but no enhancements were observed in sprint performance ($p > 0.05$).

Peng et al. [3] demonstrated that performing squats with elastic resistance resulted could improve in both sprinting and agility performance. In this study, elastic resistance was applied only during the eccentric phase, which likely limited improvements in sprint performance due to the relies on concentric strength of sprinting. However, the EREL pre-activity positively influenced agility performance, which relies more on eccentric strength for deceleration.

Conclusions

The findings suggest that performing 2 sets of 5 repetitions of DJ30 with 20% and 30% BW EREL can effectively induce PAP after 6 minutes, enhancing agility performance.

Acknowledgments

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References

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Table 1: The time of 5 m and 10 m sprint and agility performance are presented as mean (standard).

	DJ30		DJ30-20%BW		DJ30-30%BW	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
5 m sprint (sec)	1.20 (0.09)	1.20 (0.08)	1.19 (0.07)	1.17 (0.10)	1.17 (0.10)	1.18 (0.09)
10 m sprint (sec)	2.00 (0.11)	1.98 (0.09)	1.98 (0.08)	1.94 (0.10)	1.96 (0.10)	1.93 (0.09)
Agility-505 test (sec)	2.48 (0.11)	2.45 (0.11)	2.51 (0.14)	2.43 (0.09)†	2.53 (0.18)	2.45 (0.15) †

†Post-test significantly different from pre-test ($p < 0.05$).