

Effect of Added Submaximal Resistance to a Dynamic Warm-Up Protocol on Jumping, 20-meter Sprint, and Agility Performance in Collegiate Athletes



Greg Ehlers and Ryan Green

Department of Health and Human Performance, Concordia University Wisconsin

PURPOSE

The purpose of this study is to determine whether an external load added during a warm-up protocol induces an acute enhancement of performance in straight line speed, agility and lower extremity muscular power when compared to a body weight warm up protocol.

INTRODUCTION

Pre-exercise warm-up routines are important for maximizing performance and minimizing the risk of injury. Adding high intensity strength-oriented activity to a warm-up has been shown to benefit muscular power-oriented performance via post-activation potentiation, but research is limited whether low intensity added resistance can improve jumping, speed, and agility performance. The purpose of this study was to examine if adding a low intensity resistance to a full body dynamic warm-up routine can offer acute enhancement of vertical jump height, 20-meter sprint speed, and/or agility performance.

METHODS

A pre-test, post-test crossover counterbalanced experimental design was used to examine for performance differences between a dynamic warm-up protocol without added resistance and the same warm-up protocol with added resistance. 17 NCAA Division 3 college athletes (age = 21.3±1.2 years; body mass = 75.5±15.5 kg; height = 173±13 cm; 10 males, 7 females) participated in the study. Each subject participated in 2 sessions over the course of one week. All subjects were familiar with the performance assessments used. Participants were randomized to receive one of the two warm-up conditions and then returned a week later to receive the other warm-up. Added external resistance was provided via the use of resistance bands and medicine balls. Specific warm-up exercises are provided in the table to the right.

No Added Resistance Warm-Up Protocol	Added Resistance Warm-Up Protocol	Sets/Reps
	Raise Body Temperature	
5 Minute Jog	5 Minute Jog	1 x 1
	Neuromuscular Activation	
Forward Lunge	Add 10 lb medicine Ball	1 x 10
Side Monster Walk	With red band	1 x 10
Supermans	Add 6 lb Medicine Ball Hold	1 x 10
Single Leg RDL	Add 10 lb Medicine Ball	1 x 10
Leg Swings	Resisted Supine Leg Raise with Green Band	1 x 10
Sumo Squats	Add 10 lb Medicine Ball	1 x 10
Broad Jumps	Add 10 lb Medicine Ball	1 x 6
Vertical Jumps	Add 10 lb Medicine Ball	1 x 6
10 yd Accelerations	Resisted acceleration with 50 lb resistance band	1 x 3
Side Shuffle	Resisted acceleration with 50 lb resistance band	2 x 10 each side
High Box Landing	Add 10 lb Medicine Ball	1 x 4



Figure 4: Demonstration of weighted lunge



Figure 5: Demonstration of resisted side monster walk

RESULTS

SPSS Version 28 was used to analyze the data. Descriptive data, Cohen's d effect sizes, and 2 X 2 repeated measures analysis of variance statistical data are provided in Table 1. No statistically significant interactions were noted for vertical jump performance (p=0.80), 20-meter sprint performance (p=0.96) or agility performance (p=0.58).

Characteristic	Mean ± SD	Min, Max
Age (yrs.)	21.3 ± 1.2	19, 25
Height (in.)	68 ± 5.1	58, 75
Body mass (kg)	75.5 ± 15.5	48.08, 102.06
BMI (kg · m ⁻²)	25.1 ± 2.4	22.2, 30.5
Avg. Resistance Training (hrs/week)	6.3 ± 4	2, 14
Male (n)		10 (59%)
Female (n)		7 (41%)

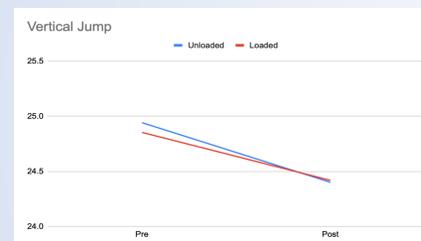


Figure 1: Graphical Comparison of Intervention Effects on Vertical Jump

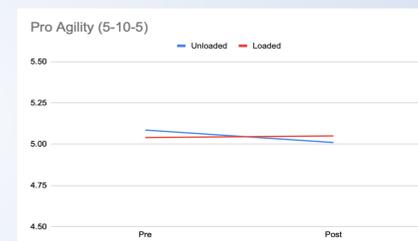


Figure 2: Graphical Comparison of Intervention Effects on Pro-Agility

Performance Measure	Intervention	Pre-Warmup (mean±SD)	Post-Warmup (mean±SD)	Cohen's d	ANOVA p-value
Vertical Jump (cm)	No Added Resistance	63.35±16.43	61.97±15.51	0.384	p=0.80
	Added Resistance	63.13±15.82	62.02±15.24	0.409	
Pro-Agility (secs)	No Added Resistance	5.09±0.42	5.04±0.42	0.317	p=0.58
	Added Resistance	5.01±0.54	5.05±0.50	-0.052	
20-meter sprint (secs)	No Added Resistance	3.34±0.46	3.29±0.36	0.229	P=0.96
	Added Resistance	3.37±0.39	3.31±0.36	0.288	

*No statistically significant interactions noted between the groups with and without added resistance

Table 2: Mean ± SD and two-way repeated measures ANOVA P-values for dependent variables



Figure 3: Graphical Comparison of Intervention Effects on 20-Meter Sprint

CONCLUSIONS

Adding submaximal resistance during the dynamic warm-up did not enhance, nor hurt, jumping, short sprinting or agility performance.

PRACTICAL APPLICATIONS

Athletes should not expect improved jump height, speed or agility performance when submaximal resistance is added to a dynamic full body warm-up. However, more research would be beneficial.

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