General vs a General and Plyometric Warm-up on Peak Force Production During an Isometric Deadlift Pull

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Introduction

Warm-ups are designed to increase range of motion (RoM) by preparing the muscles and surrounding connective tissues of the joints (Adelsberger & Tröster, 2014). One specific way to warm up is using plyometrics. It has been suggested that using a plyometric exercise can aid in physical activity as it helps with post activation potentiation (PAP; Scott, Ditroilo, & Marshall, 2017; Turner, Bellhouse, Kilduff, & Russell, 2015).

Purpose

The purpose of our study is to observe how different warm-up protocols can affect an individual's force production for a Deadlift.

Methods

Standardized Warm-Up for Both Protocols

Participants began with 5 minutes of cycling. After a two minute rest participants performed 2 sets of 10 deadlifts on an unloaded bar followed by another two minute rest. They then completed 8-10 repetitions at 50 % of their estimated 1RM, then increased the load by 20% for 3-5 repetitions. They then increased by 20% for 2-3 repetitions (Mina et al., 2016).

Warm-Up Protocol A: General

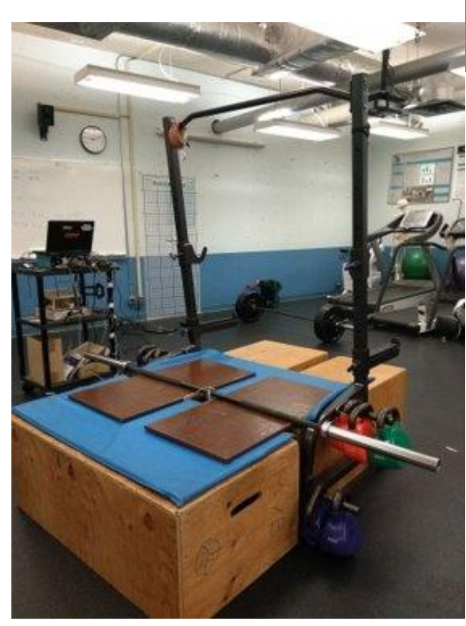
5% with a 2-4 minute rest between each lift.

Warm-Up Protocol B: Plyometric

Upon completing the standardized warm-up protocol, participants performed 1 set of six repeated drop jumps and medicine ball throws in a sit-up position.

Force Transducer for Both Protocols

Upon completion of their final lift and after their rest, participants moved up onto the force transducer for their final isometric pull.



Results

For all subjects, the general warm up condition showed an increase of 17.34 percent in the peak force production, or a mean peak of 84.2 kg in force production as compared to 71.8 kg in the plyometric warm up condition. There was an increase of 18.74 percent in the sustained force production, or a mean sustained value of 73.2 kg in the general warm up condition as compared to 61.7 kg.

The experienced lifters saw an increase in peak force production by 22.68 percent in the general warm up condition, or a mean peak value of 109.5 kg as compared to 89.2 kg. Their sustained force production saw an increase of 30.01 percent, or a mean sustained value of 97.2 kg as compared to 74.8 kg.

The non-experienced lifters saw an increase in their peak force production by 16.87 percent, or a mean peak of 70.9 kg as compared to 60.6 kg. Their sustained force production saw an increase of 12.60 percent, or a mean sustained value of 59.7 kg as compared to 53.1 kg of force production.

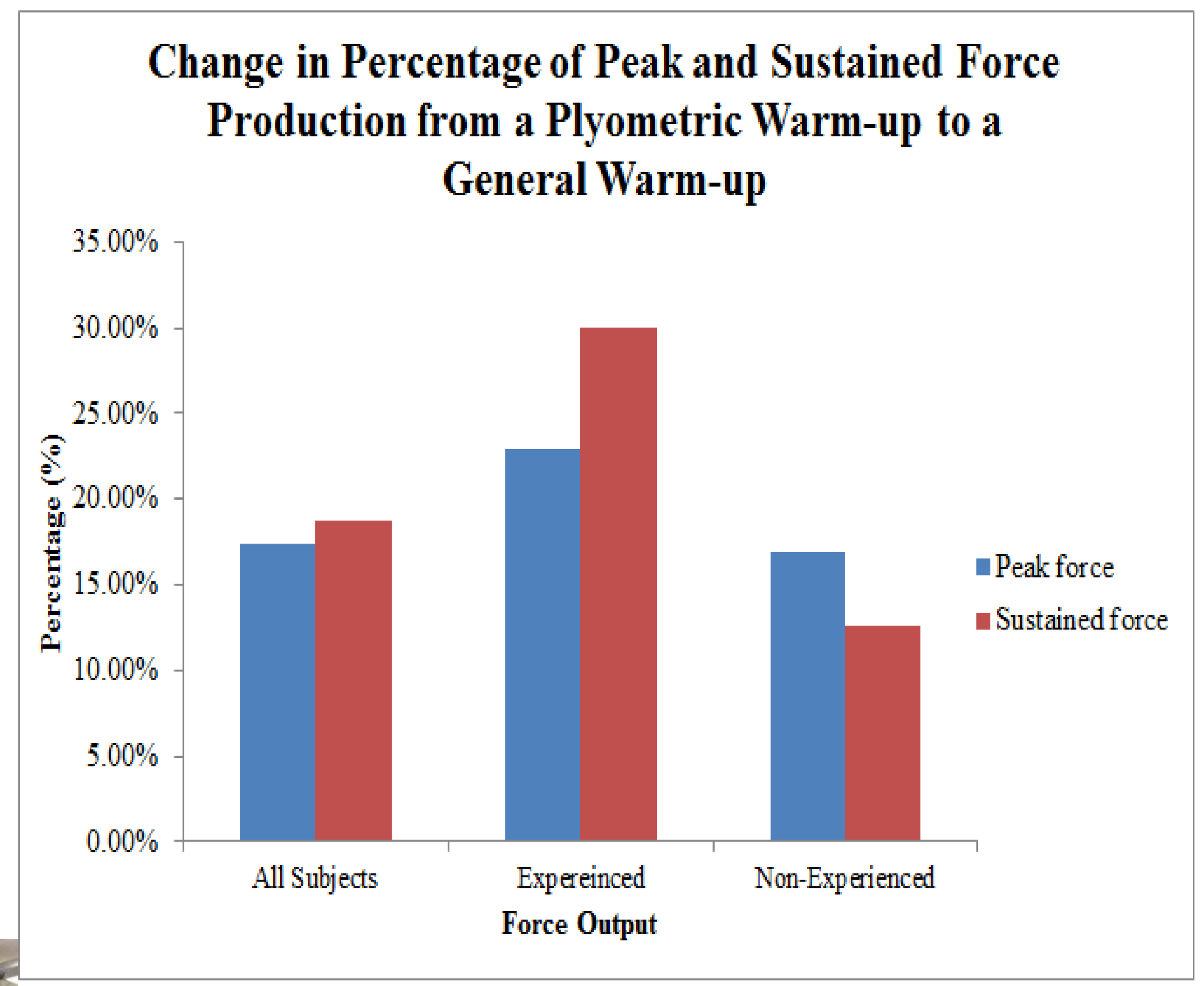


Figure 1. Percent increase in peak force production and sustained (mean) force production comparisons in all subjects, and split into experienced and non-experienced categories.

Table 1. One-way ANOVA Test Results

Source	P-value
All Subjects (n=10)	0.334
Experienced (n=4)	0.325
Non-Experienced (n=6)	0.163

Alpha level set to 0.05

Experienced lifters with 3+ years of 1RM lifts.

Non-Experienced lifters with <1 year of 1RM lifts, or an estimated 1RM.

Table 2. Peak Force Output in Kilograms

Source	General Condition	Plyometric Condition
All Subjects	84.2 kg	71.8 kg
Experienced	109.5 kg	89.2 kg
Non-Experienced	70.9 kg	60.6 kg

Alpha level set to 0.05

Experienced lifters with 3+ years of 1RM lifts.

Non-Experienced lifters with <1 year of 1RM lifts, or an estimated 1RM.

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Discussion

The current study appears to be the first study to look at the effects of plyometric exercise on an isometric contraction, changes in/to peak power, and peak power of a deadlift. The lack of significant findings could be explained by the activities chosen during the present study. The current study used drop jumps and medicine ball sit ups as a plyometric based warm up. These exercises chosen could have been non-specific towards to the deadlift motion and resulted in the fatiguing of the individuals muscles. Secondly, if the plyometric exercises chosen where not task-specific then the correct motor units may not have been activated. As a result there may not have been PAP with no immediate enhancement of muscular performance (Turner et al., 2015). The pull on the force transducer was only a pull in the forward hinged and knee bent position (bottom of the deadlift). There may not have been any changes to the power in the bottom position. Finally, when performing just the base pull it measured force production at a stage in the deadlift exercise where there was likely a lot of lateral distance in the actin and myosin filaments.

Conclusion

In conclusion, the current study found little to no improvement on the peak power of a deadlift in the two different testing protocols. Future research should look at conducting different plyometric exercises that could better engage the muscles used during a deadlift as well as could focus on different outcomes with a plyometric exercise instead of looking at peak power.

References

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