Pre-event Dynamic Warm-Up for Increased Power Performance

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Warm-up has been found to enhance performance and decrease the plausibility of eccentric exercise generated muscle damage. (McMillan et al., 2006) It is hypothesized that dynamic motion, followed by neuromuscular activation through balance and explosive movement may prove to be more beneficial than low level dynamic motion alone. The purpose of the present study was to examine the effects of a dynamic warm-up for the promotion of muscular force production (as measure via a vertical jump).

Methods:

Sixteen participants, 9 female and 7 male, were recruited from a pool of University of the Fraser Valley students with a mean age of 20.75 years. The study employed a randomized crossover design using vertical jump as the dependent variable and pre-event dynamic warm-up as the independent variable. Participants performed a baseline trial and one with 17 minutes of dynamic warm-up (see Table 1). Participants jumped down from a 15 cm step (Reebok Step Plate) and were told to land (on Force Plate) and jump up as fast and as high as they could. Counter movement of arms up to the head and lowering of body was allowed. Measures were taken at baseline before treatment, and then at 1, 6, 11 and 16 minutes.

Dynamic warm-up was performed over a 10m distance and lasted 17 minutes in total. The exact exercises are presented in Table 1.

A force plate (Kistler - Type: 928EA; Bioware 4.1.0.2.) was used to calculate time in the air and vertical jump height (VJH). Microsoft Excel was used to calculate 1-tailed t-tests ($p<0.05$), comparing each of minute 1, 6, 11 and 16 minutes to baseline jumps.

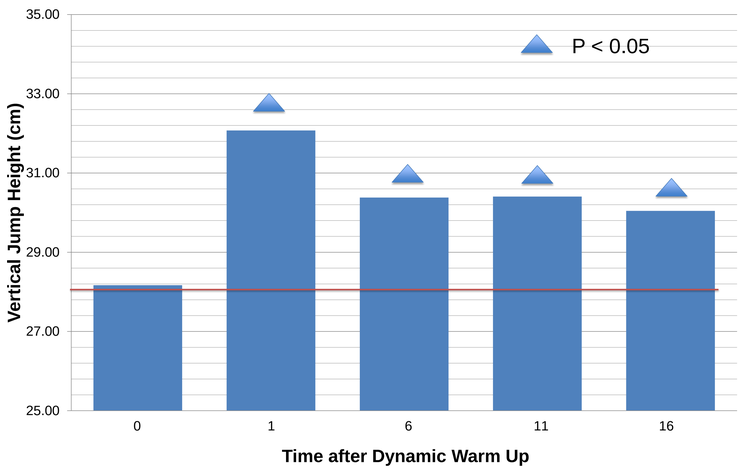
Results:

Vertical jump data was collected at 5 minute intervals following the warm up. The mean vertical jump height (VJH) at baseline was 28.17 cm with a standard deviation of +/- 8.46 cm; The mean height achieved at 1 minute was 32.08 cm (+/- 9.71 cm), at 6 minutes

Table 1. Dynamic warm-up

Exercise	Repetitions (10 m/rep)
Quick walk forward/backwards	8 reps (take your time)
Cool walk	6 reps
Cool walk to skip	6 reps
Lateral shuffle	6 reps (really get down)
Lunge to lunge (with lateral lean)	2 reps
Back lunge	2 reps
Single leg high knees/Butt kickers	4 reps (high knees there, butt kickers back)
Lateral high knee x-over	2 reps
Cross over stick and hold	2 reps
Carioca – arms still	4 reps
Carioca – arms in opposition	4 reps
Lateral shuffle (3 shuffles) with jump turn	4 reps (aim for height, stick landing)
Three step, single foot take off, land and hold	4 reps (aim for height, stick landing)
Three step, double foot takeoff, land and high knees jump	4 reps (aim for height, stick landing)
Five high knees, two feet take off	1 time

Figure 1. Vertical jump heights following dynamic warm-up



Results (cont.): 30.38 cm (+/- 10.19 cm), at 11 minutes 30.41 cm (+/- 10.59 cm), and at 16 minutes 30.04 cm (+/-10.33 cm). Each jump at the 1, 6, 11 and 16 minute intervals was compared to the initial baseline jump using a one tailed paired t-test ($p<0.05$), and were found to be significantly greater than baseline (Figure 1).

Discussion:

Significant improvements were seen when comparing the jumps at 1-16 minutes as compared to baseline prior to warm-up. Although a drop in height was seen in jumps following 1 minute, the jumps at the 6, 11 and 16 minute marks were significantly better than prior to warm up. McMillan et al. (2006) also reported significant increases in performance following a dynamic warm-up with greater performance enhancement when compared to two measures of power and agility relative to a static warm-up and no warm-up (such as our baseline).

The dynamic warm-up consisted of a combination of exercises that increased the heart rate, respiratory rate, muscle blood flow and facilitation of neural drive to the muscle. Using large muscle groups with a combination of hops, skips, jumps and various upper and lower body movement based exercises the warm up consisted of simple quick movements which replicated a playing environment. Increases in performance after dynamic warm-ups have also been demonstrated by Faigenbaum et al. (2005) in children.

Conclusion:

Dynamic warm-ups that are designed to elevate core body temperature, increase motor unit excitability, improve kinaesthetic awareness and maximize active ranges of motion contribute to increased muscle force production, increased performance, and have the potential to reduce injuries.

Faigenbaum, A., Bellucci, M., Bernieri, A., Bakker, B., & Hoorens, K. (2005). Acute effects of different warm-up protocols on fitness performance in children. *Journal of Strength and Conditioning Research*, *19*(2), 376-381.

McMillian, D., Moore, J., Hatler, B., & Taylor, D. (2006). Dynamic vs. static-stretching warm up: the effect on power and agility performance. *Journal of Strength and Conditioning Research*, *20*(3), 492-499