The Effect of Different Warm-up Protocols on young Soccer Players' Explosive Power

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Abstract

Objective: To investigating the effect of different Warm-up Protocols on young Soccer Players' Explosive Power.  
Methods: Twenty male soccer players (17.4 ± 0.685 years) volunteered to participate in this study. The participants were randomly selected, and in order to remove the effects of transmission and to observe the sequence of warm-up methods, they were cross-matched randomly e.g. 20 players in four categories; that is, 5 players in each category. The participants in each category experienced the 4 warm-up ways in four consecutive so that at the end 20 players performed each method of warm-up.  
Warm-up methods: 1. Static warm-up; 2. Dynamic warm-up plus 2 min active rest; 3. Dynamic warm-up plus 5 min passive rest and finally Dynamic warm-up plus 15 min passive rest. Participants in each category performed different warm-up methods which had been designed based on scientific and research-based sources in 48 hours intervals After performing each warm-up method, they were given a Long Jump.  
Results: Based on the results of analysis of variance between the effect of different warm-up methods on Explosive Power participants, significant difference was observed (p≤0/05) so that Dynamic warm-up plus 5 min passive rest was more effective in Explosive Power performance than other methods(p<0/05).  
Discussion: The results of this study are in line with those of Roger (2008) and Faigenbaum et al (2006) who indicated in their studies that Dynamic or mixed method of warm-up are more effective than static ones.  
Conclusion: Therefore, with regard to the results of the study presented here and also the nature of football enjoying explosive power than the air blows, it is recommended that these types of protocols during warm-up program be employed.  
Keywords: Warm up, Explosive Power, Soccer Players', Young

1. Introduction

Doing Stretching movements during warm-up has been a traditional practice in preparing for physical activity (Knudson et al., 2001). However, despite the widespread popularity of this practice, research has yet to establish a set of specific guidelines that provide the most beneficial and purposeful warm-up (Bishop, 2003b). Stretching prior to physical activity is often believed by coaches to promote better performances and decrease the rate of muscular-skeletal injuries during athletic activities (Witvrouw et al., 2004). However, stretching has recently not been supported to reduce injuries that occur during the activity (Gleim & McHugh, 1997; Thacker et al., 2004; Witvrouw et al., 2004; Andersen, 2005). The traditional warm up employed by many coaches typically includes a brief jog followed by a series of
static stretches. Static stretches, such as a standing forward bend, are performed slowly until the muscle cannot be stretched any further and then held for approximately 30 seconds (Baechle & Earle, 2000). However, in recent years, another type of warm-up called dynamic warm-up has become increasingly popular. A dynamic warm-up includes activity-specific movements, such as skips, shuffles and sprints (Faigenbaum, et al., 2005, 2006a). These stretches are designed to increase body temperature, heart rate, and flexibility (Baechle & Earle, 2000). There is a need to extend the existing research results to male athlete populations and to assess for how long after completion of the warm-up protocol these beneficial effects may be seen. Therefore, the purpose of this study was (a) to compare the effects of standardized dynamic and static warm-up protocols on, jumping performance in a group of male high school varsity soccer players, and (b) to investigate the lasting effects of the standardized dynamic warm-up on the same performance outcome at various time intervals following the warm-up.

2. Methods

2.1, Subjects

Twenty male soccer players (17.4 ± 0.685 years) volunteered to participate in this study. Prior to testing, all subjects were required to complete an Institutional Review Board approved study consent and assent form, a Physical Activity Readiness Questionnaire (PAR-Q), and a general subject questionnaire. Only those who were healthy as determined by the PAR-Q were allowed to participate in the study. The participants were randomly selected, and in order to remove the effects of transmission and to observe the sequence of warm-up methods, they were cross-matched randomly e.g. 20 players in four categories; that is, 5 players in each category. The participants in each category experienced the 4 warm-up ways in four consecutive so that at the end 20 players performed each method of warm-up.

2.2, Warm-up methods

- A standardized 10 min static warm-up with an approximate 2 minute rest time interval until performance testing [S2].
- A standardized 10-min dynamic warm-up with an approximate 2 minute rest time interval until performance testing [D2].
- A standardized 10-min dynamic warm-up with 5 min passive rest interval until performance testing [D5].
- A standardized 10-min dynamic warm-up with 15 min passive rest interval until performance testing [D15].

The standardized static and dynamic warm-up protocols used in this study were adopted from previous research by Faigenbaum et al (2005) and Roger (2008).

2.3, Experimental Study Procedures

The study was designed so that participants served as their own controls when comparing the performance effects of different warm-up protocols. The order of the warm-up protocols of each subject was randomly assigned using the format shown in Table 1.

| Session1 | Session2 | Session3 | Session4 | Session5 |
|----------|----------|----------|----------|----------|
| Order1   | Practice | S2       | D2       | D5       | D15      |
| Order2   | Practice | D2       | S2       | D15      | D5       |
| Order3   | Practice | D5       | D15      | S2       | D2       |

Table 1. Warm-up Protocol Orders
2.4, Equipment

Standing broad (long) jump: stand with toes on a line and jump as far forward as possible, landing on both feet. The distance between the line and the heel of the foot closest to the line was measured using a standard tape measure (Stanley; New Britain, CT) to the nearest 0.5-centimeter. Three attempts were performed and the longest distance of the three attempts was used for statistical analysis.

2.5, Statistical Analysis

A one-way repeated measures analysis of variance (ANOVA) and Benfrioni’s post-hoc tests were used to examine the differences in performance test scores following the completion of the 4 different warm-up protocols. Statistical significance was set at the p<0.05 level of probability. All analyses were conducted using the Statistical Package for Social Sciences( ver.16).

3. Results

Results are shown in Table 2. Repeated measures ANOVA on the warm-up conditions demonstrated a significant difference among the four different procedures (F = 13.04; p<0.00). Post-hoc comparisons (Benfrioni’s New Multiple Range Test) revealed that participants’ standing broad jumps were significantly longer following D5 (221.45±15.4 cm) and D2 (219.87±14.68 cm) warm-ups than in D15 (215.3 ±13.47 cm) and S2 (215±13.48 cm).
Table 2. Standard Performance Test Results (Mean + SD)

| Variable                  | Experimental warm-up groups |
|---------------------------|----------------------------|
|                           | S2        | D2         | D5         | D15        |
| Standing long jump (cm)   | 215 ± 13.48 | 219.87 ± 14.68 | 221.45 ± 15.4 | 215.3 ± 13.47 |

4. DISCUSSION

This is the first study in high school male soccer players designed to examine the acute effects of a standardized static warm-up compared to a dynamic warm-up protocol following various pre-determined rest intervals prior to performance testing. Findings indicate that standing broad jump performance was significantly farther (2.9%) in the D5 compared to the D15 study condition. These results are important to help identify the most effective warm-up protocols for high school.

Female athletes in sports that rely heavily on sprinting and jumping abilities. The present findings are consistent with some (Roger, 2008 and Faigenbaum et al., 2005, 2006a) but not all (Faigenbaum et al., 2006b) previous investigations that have explored the impact of dynamic warm-up within 2 minutes or less prior to performance testing in youth athletes. Faigenbaum et al. (2005) found a 2% improvement in standing broad jump following a dynamic warm-up when compared to a static warm-up condition in youth subjects. However, in a study with high school female athletes (Faigenbaum et al., 2006b), significant improvements in standing broad jump were only found when using a dynamic warm-up with a weighted vest of approximately 2% of the subjects bodyweight compared to the static warm-up condition. Moreover, there was a non-significant improvement of 5% in the broad jump following a dynamic warm-up compared to a static warm-up Duncan and Woodfield found no significant differences; however, vertical jump was increased 2.2 cm when following the no warm-up condition compared to the static warm-up. Finally, the female high school soccer players. Thus results from study investigated the acute responses to warm-up in this study cannot necessarily be generalized to other non-athletic populations (Duncan & Woodfield 2006).

The physiological mechanism(s) behind the observed warm-up protocol specific changes in jump performance are currently not clear. First, one possible explanation may involve the so-called post activation potentiation (PAP) phenomenon. The contractile response of a muscle depends on the history of its activation. A brief period of intermittent stimulation (i.e., dynamic warm-up) results in enhanced contractile response while continuous stimulation results in fatigue (Rassier & MacIntosh, 2000). Currently, it is uncertain how long the performance enhancing effects last. However, previous research suggests enhancement begins to return to baseline levels 20 minutes following the stimulus (Chiu et al., 2003; Gullich & Schmidtbleicher, 1996). PAP appears to have its greatest effect on fast twitch fibers, the same fibers that are probably predominantly used when performing the dynamic warm-up exercises in the current study (Golhoffer et al, 1988) and also has a greater impact on trained athletes (Duthie et al., 2002; Young & Behm, 2003). Although past research in adults suggests performance-related enhancements can last up to 20 minutes, current results suggest this window of opportunity may be shorter in duration in children. An increase in muscle temperature is another possible mechanism for the observed performance enhancement. Previous findings have suggested that within 3-5 minutes of the onset of moderate intensity exercise, muscle temperature rises approximately two degrees Celsius (Bishop, 2003b). Ten minutes of moderate to fast movements during the dynamic warm-up may have increased muscle temperature sufficiently to allow for the observed performance improvements seen in D2 and D5 study conditions, but not the D15 condition. It
is possible that shorter warm-ups of less than 10 minutes may not have as long of an effect as found in the current study; however, more research is needed.

Soccer is a unique sport in which players not only warm-up before each of the two regular periods of the match, but may also be required to do so at other times (e.g., after they temporarily leave a game only to re-enter it later as a substitute again). The present findings suggest an improved jump performance at 5 minutes following a dynamic warm-up compared to at 15 minutes. Knowledge of this limited window during which beneficial effects on jump performance may become evident following a dynamic warm-up may be of practical importance for participants in this sport.

Future research should also be directed at the chronic effects of different warm-up protocols in young athletes with the ultimate goal to establish empirically derived, safe and sport-specific warm-up procedures designed to enhance performance.

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