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Effect of Post-Warm-Up Transition Time on Anaerobic Performance in Female Collegiate Volleyball Players

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Effect of Post-Warm-Up Transition Time on Anaerobic Performance in Female and Male Collegiate Volleyball Players

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Abstract

Post-warm-up transition time (PWTT) is the period between the end of a pre-game warm-up and the beginning of gameplay at a particular sporting event. During this period, typical pregame traditions are completed such as the National Anthem and recognition of players and coaches. This length of time can vary from sport to sport. It is recognized that a dynamic warmup is encouraged to improve performance and decrease the risk of injury. It is also recognized that rest periods are necessary for optimal performance. Too short of a recovery time can result in muscle tissue damage, but too long of a recovery time can nullify the effects of the warm-up. Little research exists to determine the optimal PWTT that results in peak anaerobic performance. Therefore, the purpose of this study was to identify the PWTT that resulted in optimal performance on a series of anaerobic fitness tests among collegiate volleyball players. Four biologically female and two biologically male Hope College volleyball players completed three testing sessions in which they completed a standard dynamic volleyball warm-up and were randomly assigned to a condition of 5-minute, 12, minute, or 20-minute recovery times. Following the recovery time, participants completed a vertical jump test, agility T-test, and 20 m sprint test. Maximum heart rate was monitored and recorded throughout each testing session, along with perceived intensity following the completion of each test. It was hypothesized that the 5-minute condition would yield the best performance results. Significant results would encourage the revision of pregame traditions in order to shorten PWTTs to maximize anaerobic performance. One-way ANOVAs for each fitness test showed that there was no significant difference in anaerobic performance across PWTTs, but an approach to significant occurred in the 5-minute condition for the 20 m sprint test. Future research should feature a larger sample size with an emphasis on anaerobic movements with a similar demand as the 20 m sprint.

Introduction

A consensus exists concerning the importance of an adequate warm-up prior to engaging in exercise to optimize performance (3). There are multiple physiological mechanisms by which warm-ups work to benefits performance. These include improved blood flow, enhanced metabolic responses, and reduced risk of injury (2,4). Studies have found that dynamic warm-ups work best at initiating these physiological responses (6).

Like the importance of a dynamic warm up prior to exercising, it is also necessary for rest periods that allow for the body to recover before engaging in activity to occur before main training sets begin. Rest periods are especially important in power sports to avoid injury and fatigue (1). One study found that shorter rest periods between resistance exercises resulted in greater damage to the muscle tissues and prolonged inflammatory response (7).

It is unclear how long the effects brought on by a dynamic warm up last, and at what point they begin to wear off. It is important to determine the timeline in which warm-up effects last in order to best maximize performance and decrease injury of risk.

The importance of both a warmup and a rest time before exercising is clear, but what remains unclear is the rest time following a dynamic warm up that elicits the best performance. Studies have found that a 10-minute post-warm up transition time compared to either a 20- or 45-minute PWTT resulted in optimal swim performance (5,8). Similarly, a study comparing the effects of 3-, 10-, and 17-minute wait times on anaerobic performance in basketball players found that optimal performance occurred after the shortest wait time (9). Our study is pertinent in understanding the safest warm-up protocols that result in optimal performance for sports utilizing anaerobic movements such as volleyball.

Purpose

The purpose of this study is to determine how varied post-warm-up transition time (PWTT) affect optimal anaerobic power (vertical jump), agility (T-Test), speed (20-m sprint), and perceived intensity of exercise (Borg Cr-10) in female and male collegiate volleyball players.

Methods

Recruitment: Participants were recruited by email an in-person announcements, and included members of the Hope College women's volleyball team and men's club volleyball team who adhered to the following criteria:

- ≥18 years old
- Current or former Hope college volleyball player
- Free of injury and able to complete anaerobic fitness tests
- Free of health concerns that may inhibit prolonged standing
- Free of pregnancy concerns

Data Collection: Each participant completed three wait-period conditions on three independent days of data collection, with each condition separated by 2-5 days. On each day of data collection, participants were fitted with a heart rate monitor and engaged in a standardized volleyball warm-up, a 5, 12, or 20 minute assigned standing wait period, and subsequent tests of power, agility, and speed. Maximum heart rate and perceived intensity were recorded after each test.

Data Analysis: Descriptive statistics were conducted on the demographic data. One-way ANOVAs were calculated for each fitness tests and CR-10 scales to see if there was a difference between conditions with a p value set at 0.05.

Results

Figure 1. Participant demographics, anthropometrics, and athlete status.

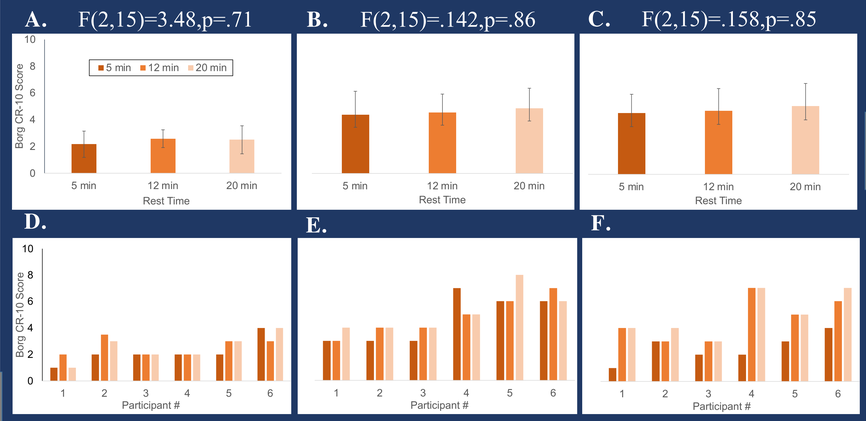

Figure 2. Average perceived intensity for each anaerobic fitness test and individual perceived intensity for each anaerobic fitness test. **A**. Mean vertical jump perceived intensity. **B**. Mean 20 m sprint perceived intensity. **C.** Mean T-test perceived intensity. **D.** Individual vertical jump perceived intensity. **E.** Individual 20 m sprint perceived intensity. **F**. Individual T-test perceived intensity.

Results

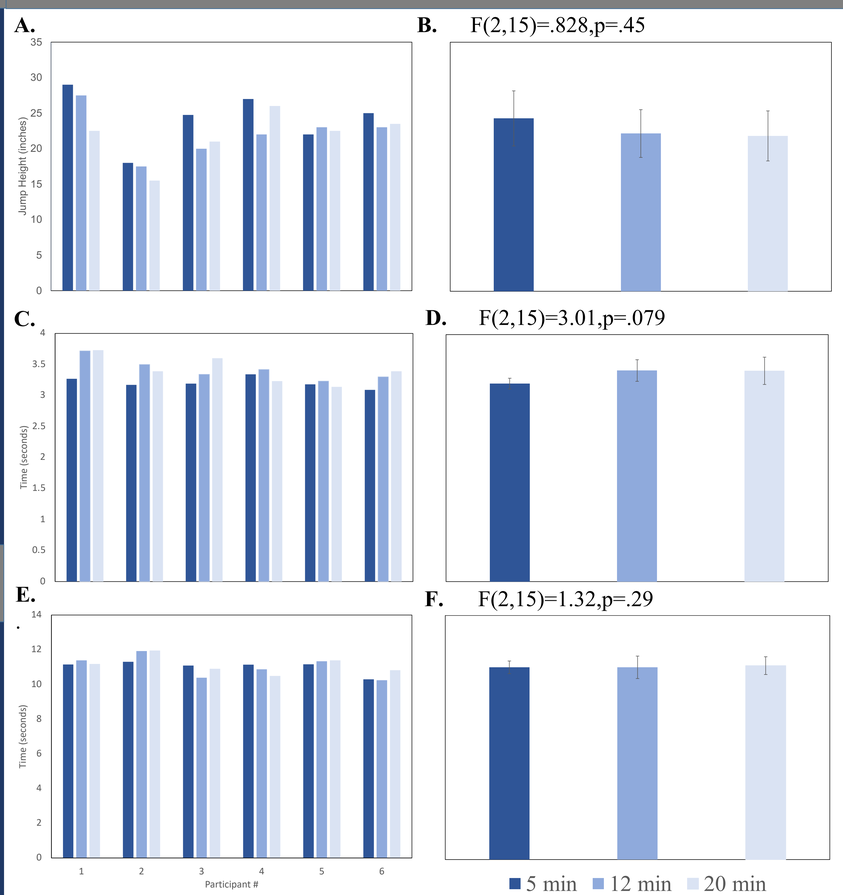

Figure 3. Individual performance results for each anaerobic fitness test following prescribed wait times and mean scores for each fitness test following the prescribed wait times. **A**. Individual vertical jump scores **B**. Mean vertical jump scores **C.** Individual 20 m sprint times **D.** Mean 20 m sprint times **E.** Individual t-test times **F.** Mean t-test times

Discussion

Based on the results, we accept the null hypothesis, since there was no significant difference in anaerobic performance in relation to post warm up rest time. While not significant, based on visual analysis of the graphs it seems that the 5-minute condition may have a favorable effect on performance in the 20 m sprint. A larger sample size may confirm this notion, as a major study limitation includes the small population. As such, future research should utilize a larger sample size. There is also means to suggest that future studies should focus on anaerobic sports that present a similar demand as the 20 m sprint test when assessing the effect of post-warm up wait time.

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