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Original article

Defensive pressure affects basketball technical actions but not the time-motion variables

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Abstract

Background: Novel player tracking technologies can change the understanding of performance determinants in team sports by allowing to accurately measuring the activity demands. The aim of this study was to identify how the defensive pressure affects the time-motion variables and the technical actions in basketball.

Methods: Twenty international male players (age: 16.05 ± 2.09 years, weight: 73.13 ± 8.10 kg, height: 183.10 ± 5.88 cm) played two 10 min basketball quarters, where they used a man-to-man 1/4-court defense until the 4th min (F1/4), changed to man-to-man full court (FULL) for 3 min and, from the 7th to the 10th min returned to 1/4-court defense (S1/4). A computerized notational analysis was performed using Simi Scout and positional data were captured with the Ubisense Real Time Location System (mean sampling rate 3.74 ± 0.45 Hz per transmitter/player).

Results: The time-motion variables presented similar results between defensive conditions, showing a total distance covered around 90 m/min. However, results suggested possible vertical jump impairments in S1/4 periods. There was more distance covered while jogging in the offensive court (38.15 ± 12.17 m/min offensive court *vs.* 32.94 ± 10.84 m/min defensive court, $p < 0.05$) and more distance covered while running in the defensive court (16.41 ± 10.27 m/min offensive court *vs.* 19.56 ± 10.29 m/min defensive court, $p < 0.05$).

Conclusion: These results suggest how to improve task representativeness during specific conditioning or game-based training situations and also to help coaches' strategic decisions during the games.

Keywords: Activity demands; Performance analysis; Performance indicators; Team sports

1. Introduction

Performance analysis in team sports aims to measure and process data from training sessions and competitions in order to use the information to enhance future performances.[1] Therefore, important information may be provided about players and teams' strengths and weaknesses,[2,3] which allow coaches to improve their training sessions.[4] Novel player tracking technology is changing the way we understand team sports.[5] In fact, current radio-signals or camera-based systems track the movements of every player on the court,[6,7] measuring accurately, for example, speed and distance covered.[8] In basketball, some examples include how fast a player moves, how far he/she traveled during a game, and much more. Unfortunately, research using these systems is still very scarce.[6,8]

The available research is focused on performance described by the game-related statistics, as variables that capture the frequencies of technical actions.[9–11] Research using these variables allowed identifying the actions most related to successful performances.[12] For example, the defensive rebounds, 2-point

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field goals and assists are considered as strong discriminants between winning and losing teams.[2,13–15] Overall, these variables appear to help coaches to develop the most appropriate training tasks and increase the teams' probability of winning.[13] The physiological demands of basketball games have been described earlier.[16,17] For instance, it was found that young players covered a total distance of 115 m/min during a game,[18] while in adult players values ranged from 130 to 133 m/min.[19] Apparently, maximum benefits are obtained when the training stimulus is closer to competition requirements.[20] Therefore, it is vital to provide valid information to coaches about the physical demands of the game so they can set up more specific and adequate conditioning programs.[21]

Despite the available research focused on performance analysis, information about the effects of manipulating defensive systems during the games is very scarce. Anecdotally, it is believed that defensive systems with constant pressure on the opponents are to be effective strategies to win a game.[22,23] For example, Wissel[23] stated that an optimal defensive system will increase the number of steals, interceptions and increase the number of missed shots in the opponents' team.

The most frequent level of defensive pressure is the man-to-man 1/4-court defense. In this level of pressure, the players defend their direct opponent' only when he is positioned in the offensive 1/4-court.[17,24] During the game, coaches frequently ask the players to extend the man-to-man defense to a full court level, aiming to delay the ball transition from defense to offense and impair the opponents concentration in offense.[24] There is a coaching belief that changing the defensive pressure to full court increases energy demands and impairs offensive performances, however, there is no available research confirming this hypothesis.

In fact, research under this topic examined the efficacy of different defensive strategies and suggested that 1/4-court defense and full-court press showed efficacies above 50%.[25] There is also evidence that more points are scored against man-to-man defenses and that this defense generates more turnovers, while the zone defenses increase the number of committed faults.[26] From a physiological standpoint, the man-to-man and the zone defense seem very similar for game-activities changes (1.053 *vs.* 1.056), frequency of high-intensity bouts (253 *vs.* 224), or heart rate (93.3% ± 2.1% *vs.* 92.8% ± 1.8% from the maximum heart rate).[17]

Therefore, it might be expected to identify several differences in game-related statistics and time motion variables between these 2 levels of defensive strategies (1/4-court defense and a full court press). These results would be very helpful to improve basketball practice specificity and coaches' strategic decisions during the games. Thus, the aim of the present study was to identify the effects of defensive pressure on technical actions and time-motion variables in basketball.

2. Methods

2.1. Experimental approach to the problem

A cross-sectional field study was used to identify the effects of defensive pressure (1/4-court defense and a full–court press) on technical actions and time-motion variables in basketball. The data were collected during a simulated basketball game, played in official court (28 × 15 m) with official rules and 3 referees. The players were rated by the national head coach according to their overall playing performances: passing ability, ball control, shooting, game perception, and decision.[27] Based on this classification, the players were assigned alternately into 4 balanced teams (A, B, C, and D). Each team played two 10 min quarters (A *vs.* B played 1st and 3rd periods; C *vs.* D played 2nd and 4th periods) interspaced with 15 min of passive recovery. Two time-outs were conceded at the 4th and 7th min to allow changing the defensive system. The players were instructed to use 1/4-court defense until the 4th min (F1/4). After that, the defense changed to man-to-man full court (FULL) and, from the 7th to the 10th min returned to 1/4-court defense (S1/4).

2.2. Participants

Twenty semi-professional male basketball players volunteered to participate in this study (age: 16.05 ± 2.09 years; weight: 73.13 ± 8.10 kg; height: 183.10 ± 5.88 cm; weekly practice: 10.9 ± 1.94 h and playing experience: 7.1 ± 1.1 years). All participants were part of a International Basketball Federation (FIBA) mid-level European national team and the players competed in their different clubs during the 2011/2012 season. The players, their parents and coaches agreed with the protocol description and were notified that they could withdraw from the study at any moment. An informed written consent was obtained from each participant's parents. This study was conformed to the Declaration of Helsinki and was approved by both the Ethics Committee of the University of Vienna (Austria) and the Portuguese Foundation for Science and Technology (Portugal, PTDC/DES/098693/2008).

2.3. Procedures

The identification of performance predictors in team sports should be preferentially done directly in game situations[28] and manipulating task constraints.[29] These research approaches allow overcoming several limitations from descriptive studies, which only provide statistics of performance.[29,30] From a research design perspective, this study could be counterbalanced in order to account for the order effect in the defensive situations; however, the FULL situation has no coaching interest, unless used in the course of the game. Consequently, we have only counterbalanced the man-to-man 1/4-court defense.

2.4. Instruments

The game was recorded with a standard digital camera located 5 m above the basketball court. The video files were downloaded to a computer and a notational analysis was performed using Simi Scout software (Version 2.0.0.174; Simi Reality Motion Systems GmbH, Unterschleissheim, Germany). The following individual and team performance variables were registered: field goals, rebounds, steals and block shoots, free-throws, fouls, team number of ball possessions, team effective field goal percentage, team offensive rebounding percentage,