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Original paper

Match running performance in elite Australian Rules Football

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Abstract

There is little information describing the match running demands of elite-level Australian Rules Football (AF). The aims of this study were to examine: (1) match running demands; and (2) the influence of periods of increased physical activity on subsequent running performance in the Australian Football League. Time-motion analyses were performed 1–9 times per player from 16 professional AF players from the same club during games in 2005–2007, using portable global positioning systems during 65 matches. Game movements (standing, walking, jogging, running, higher-speed running, and sprinting) and distances (total distance covered [TD]; low-intensity activity [LIA, distance <14.4 km h^{-1}]; and, high-intensity running distance [HIR, distance > 14.4 km h^{-1}]) were collected. The influence of the first half physical activities on second half activities, and each quarter on the subsequent quarter were analysed. The mean (±SD) TD and HIR distance covered during the games were 12,939 ± 1145 m and 3880 ± 663 m respectively. There were reductions in TD in the second (−7.3%), third (−5.5%) and fourth (−10.7%) quarters compared to the first quarter ($p < 0.01$). The HIR was reduced after the first quarter ($p < 0.001$). Players that covered larger TD or HIR during the first half or quarter decreased distance in the next half and quarter, respectively ($p < 0.001$). These results show that a reduction in exercise intensity is inevitable during an AF match and that higher intensity activities reduce towards the end of games. High average speed during each half or quarter also affects subsequent running performance in elite-level AF.

Keywords: Match analysis; High-intensity running; Team sport; Intermittent exercise

1. Introduction

Australian Rules Football (AF) is a popular sport in Australia. The elite competition, the Australian Football League (AFL) draws the largest public support and television audience of any sport in the country. There have been few peer-reviewed research studies that describe the match activity profiles of elite-level AF players.[1–3] Indeed, Dawson et al.,[1] estimated from video analysis that top-level players cover between 10,761 m and 18,801 m during a game with midfielders covering the greatest total distance in games (∼17,000 m), and the full forwards and fullbacks travelling the least (∼13,600 m). These estimated distances compare well with Norton et al.,[4] who used real-time hand computer tracking of players in a commissioned report on AFL matches (20 midfielders covered an average of ∼17,500 m), but are considerably greater than earlier reported distances using manual player tracking methods (∼4000–11,000 m).[5,6]

Portable global positioning system (GPS) devices are now permitted to be worn by players during AFL matches and these are used by all teams competing within the AFL. Indeed, the AFL now commissions time-motion research projects annually and a large database of match GPS data is collected each season.[7–10] These reports have shown that elite-level AFL players have reduced the distances travelled during a game from 12,450 ± 1650 m to 12,180 ± 1890 m[10] from 2005 to 2008. The amount of time spent on the field during matches for these players has also decreased from 111 ± 14 min to 100 ± 14 min during the same period,[10] resulting in an increased average speed. Variations of physical activity profiles have also been reported between positional

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roles and within quarters. Specifically, players who competed as fixed forwards ($N = 121$) and fixed backs ($N = 122$) covered $11{,}920 \pm 2080$ m and $11{,}880 \pm 1920$ m, respectively, whilst the remaining 'nomadic' players covered $12{,}310 \pm 2010$ m ($N = 1153$). It was also shown that the 'nomadic' players travel at a faster mean speed than the other positions and spend less time on the field during a match than the other positions.[10]

Between-quarter variations have also been observed in the physical activity profile of AFL players, with the greatest distances travelled during the first quarter (3070 ± 630 m) and a moderate reduction being reported in the fourth quarter (2840 ± 630 m).[10] A similar trend in the mean speed has also been reported with speeds of 7.66 ± 0.85 km h^{-1}, 7.37 ± 0.77 km h^{-1}, 7.33 ± 0.80 km h^{-1}, and 7.10 ± 0.88 km h^{-1} shown for the first, second, third, and fourth quarters, respectively.[10] Unfortunately, the data from these AFL reports have not been peer-reviewed and the time and distance data has been obtained from different GPS devices which make analysis and interpretation of the results difficult.[11] It has been shown that measures between different GPS devices of the same model can differ 32.4% for high-intensity running (>14.5 km h^{-1}) and 6.4% for total distance during team sport running patterns.[11] Consequently, it has been suggested that results from different GPS units should not be used interchangeably, especially when analysing high-intensity running.[11,12]

At present there is little detailed information describing match demands at the elite level, or variations in physical activity patterns during an AF match. Therefore, the aims of this study were to describe the match running demands of AFL players and to examine the influence of periods of intense exercise on subsequent physical activity in the AFL. It was hypothesised that high-intensity running performance would decrease during matches and that periods of intense exercise would be followed by periods of reduced performance.[13]

2. Methods

Time-motion analysis of physical performance was collected from 16 professional Australian football players (age: 23.9 ± 3.1 years, body mass: 86.3 ± 8.1 kg, and stature: 187.5 ± 5.3 cm) from the same club. The team finished 13th (2005), 15th (2006) and 12th (2007) out of 16 teams competing in the AFL during the seasons analysed. Players were measured in a number of different positions and their role within the team structure may have changed during the games analysed. The methods for study were approved by a university ethics committee and by the AFL club involved.

Time-motion analyses were performed 1–9 times on each player. Data was collected from 25 different official matches (1–4 samples per game) for a total of 79 individual samples. The time-motion data was only included in the analysis if the player participated > 75% of total match time, which provided 65 complete data files.

Match distance and speed were collected at 1 Hz using a portable GPS device (SPI 10, GPSports, Canberra, Australia) and reduced using proprietary software (GPSports Analysis v1.6, GPSports, Canberra, Australia). During games, the players wore the same GPS devices in a custom-made pouch fitted between their scapulas. This GPS device has previously been shown to provide valid measures for distance at an acceptable level of accuracy and reliability for total distance (-4.1 ± 4.6% of true distance) and peak speeds (coefficient of variation ± 90% confidence interval: 5.8% (5.2–6.6%)) during high-intensity, intermittent exercise, but poor inter-unit reliability for distance travelled at higher intensity activities (32.4% for high-intensity running distance [>14.4 km h^{-1}, HIR]).[11]

Changes in game movements and distances were analysed during each quarter of match play using the pooled data of all 65 data files.

Game movements: The time spent and distances covered in six locomotor categories [standing (0–0.7 km h^{-1}), walking (0.7–7 km h^{-1}), jogging (7–14.4 km h^{-1}), running (14.4–20 km h^{-1}), higher-speed running (20–23 km h^{-1}), and sprinting (>23 km h^{-1})] were calculated.

Match distances: Total distance covered (TD), low-intensity activity (LIA) distance (<14.4 km h^{-1}); and HIR distance (>14.4 km h^{-1}) were calculated. The frequency of HIR and the highest speed recorded during the game for each player were recorded. These speed zones were selected as they reflect the zones previously reported in recent time-motion analysis literature in field-based, team sports.[13–15] The frequency of high speed zone entries (sprints > 23 km h^{-1}) and the highest speed recorded during the game were also collected. Average speed (m min^{-1}) was also calculated from the distance covered in each quarter divided by the time spent on the ground for each individual player.

According to the methods previously described,[13] the individual player data ($N = 65$) for TD during the first half were divided into two subsets (i.e. 'High' and 'Low', median split technique, $N = 32$) based on physical activity in the first defined period (i.e. first half or defined quarter) to examine the effect of physical activity measures during each following period. The same procedure and analysis was applied using the TD, HIR and average speed data during the first half or defined quarter, to examine the influence of that physical activity on the physical activity during the following half or quarter.

Data are presented as the mean ± standard deviation (SD). Before using parametric statistical test procedures, the assumptions of normality and sphericity were verified. Statistical significance was set at $p < 0.05$.

A one-way analysis of variance (ANOVA) for repeated measures was used to test the differences in the objective measures of match running performance (game movements, match distances and other match analysis measures) between