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Activity profiles in adolescent netball: A combination of global positioning system technology and time-motion analysis

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ABSTRACT

Yong, L.C., Wylde, M.J., Choong, G.C.W., & Lim-Prasad, D. (2015). Activity profiles in adolescent netball: A combination of global positioning system technology and time-motion analysis. *J. Hum. Sport Exerc., 9*(Proc2), pp.S707-S711. Purpose: This study sought to understand the activity profiles of adolescent netball players in match play conditions. To date there has been no published research in this area and such findings would give important insights to inform the training and preparation of adolescent netball players. Methods: Twenty-two adolescent netball players (age 14.5 ± 0.5 y, stature 165 ± 5 cm, body mass 58.32 ± 7.43 kg) were analysed while competing in a specially arranged outdoors match of 6 x 10 min periods. The players were categorised into one of three positional groups. To track the players' movement GPS units were worn located between the scapulas in a purpose built harness. The match was filmed so that post-match time-motion analysis could be carried-out. Both the GPS and time-motion analysis data was classified into one of six movement categories for analysis. Results: Midcourt players covered the greatest distance per quarter (37.73 ± 17.39 m/min) with the Attacking players covering the least distance (35.42 ±11.66 m/min). The Attacking players covered the greatest distance per quarter through sprinting (8.5 ±16.2 m/qtr), travelling nearly twice the distance of the other two groups. When comparing the mean frequency and duration of movements from the GPS and time-motion analysis, there was a discrepancy between the two methods. Conclusions: The results from this study suggest that in adolescent netball Midcourt players cover the greatest distance per quarter while Attacking players cover the greatest distance through sprinting. A comparison between data from the GPS and time-motion analysis suggest that the GPS units used in this study under report the frequency and duration of high intensity movements. **Key words**: TIME-MOTION ANALYSIS, GPS, ADOLESCENT ATHLETES, NETBALL.

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INTRODUCTION

To date global positioning system (GPS) technology has been used across a range of team sports to improve the accuracy of movement analysis. The major advantages that GPS has over video-based time-motion analysis are that data can be generated in real-time and is more precise, with player movements being tracked more than 100 times per second (Carling et al., 2009). An assessment of the use of GPS units for measuring athlete movement, has found GPS technology to be valid for the measurement of both distance covered and peak speeds (Johnston et al., 2013).

Netball is a sport that is primarily played indoors and therefore there is currently no published research on the use of GPS within the sport. Studies have instead focused on time-motion analysis where player movements are subjectively classified into various categories based on movement intensity. These time-motion analysis studies have focused on senior level netball (Davidson & Trewartha, 2008; Fox et al., 2013), which means the demands of adolescent netball remain relatively unknown.

As the increase in physical challenge is a major obstacle for youth athletes when transiting to the senior team (Finn & McKenna, 2010), it is important to understand the differences between youth and senior level competition. The current study therefore sought to understand the activity profiles of adolescent netball players in match play conditions. To date there has been no published research in this area and such findings would give important insights to inform the training and preparation of adolescent netball players. This study would also act as a means for assessing the use of GPS technology for the analysis of player movement in netball.

MATERIAL AND METHODS

Twenty-two adolescent netball players (age 14.5 ± 0.5 y, stature 165 ± 5 cm, body mass 58.32 ± 7.43 kg) were analysed while competing in a specially arranged outdoors match of 6 x 10 min periods. The players were categorised into one of the following three positional groups:

- Defence (Goal Defence and Goal Keeper)
- Midcourt (Wing Defence, Centre and Wing Attack)
- Attack (Goal Attack and Goal Shooter)

To track the players' movement GPS units were worn located between the scapulas in a purpose built harness. The sample rate of 5 Hz was used for the data collection.

The match was filmed so that post-match time-motion analysis could be carried-out using SportsCode Pro (Sportstec™ Limited, Warriewood, Australia). The following movement classifications were used for both the GPS and time-motion analysis data: Standing, Walking, Jogging, Running, Sprinting and Shuffling. These movement classifications are well established having been used in a number of studies of netball: Otago (1983), Steele & Chad (1992), Davidson & Trewartha (2008) and Fox et al. (2013).

Differences between movements were analysed using magnitude-based Cohen's (1988) effect size (ES) with modified qualitative descriptors (Hopkins, 2000). Effect sizes were assessed using these criteria: <0.20 = trivial, 0.20 to 0.60 = small, >0.60 to 1.20 = moderate, >1.20 to 2.00 = large, and >2.00 = very large. Ninety per cent confidence limits (±90% CL) were calculated to indicate the precision of the estimate of observed effects.

RESULTS

Based on the GPS data, the Midcourt players covered the greatest distance per quarter (37.73 ± 17.39 m/min) in adolescent netball, with the Attacking players covering the least distance (35.42 ±11.66 m/min).

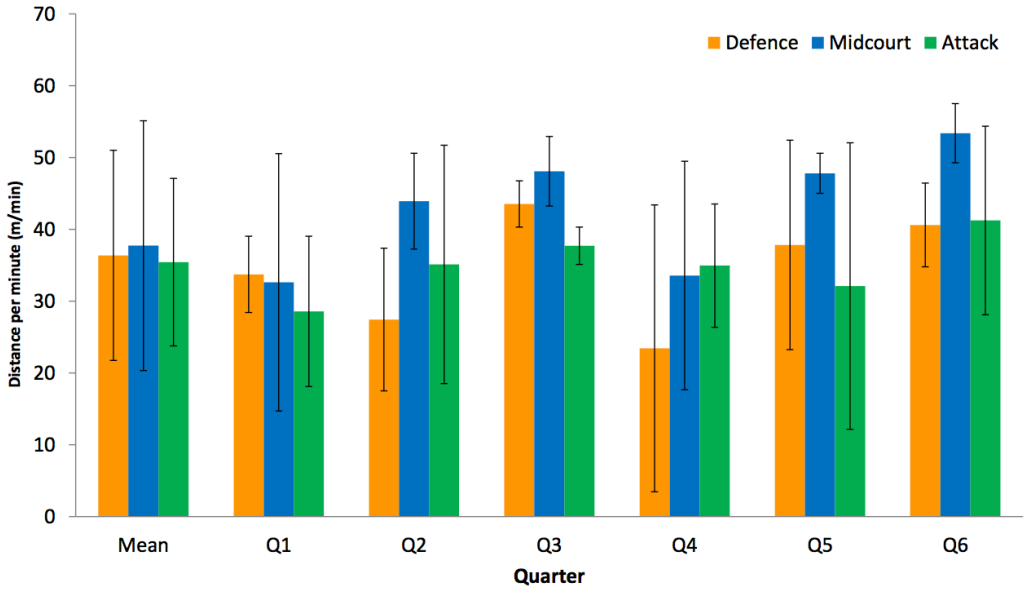

Figure 1. GPS data: distance covered per quarter, mean ± SD

The Attacking players covered the greatest distance per quarter through sprinting (8.5 ±16.2 m/qtr), travelling nearly twice the distance of the other two groups.

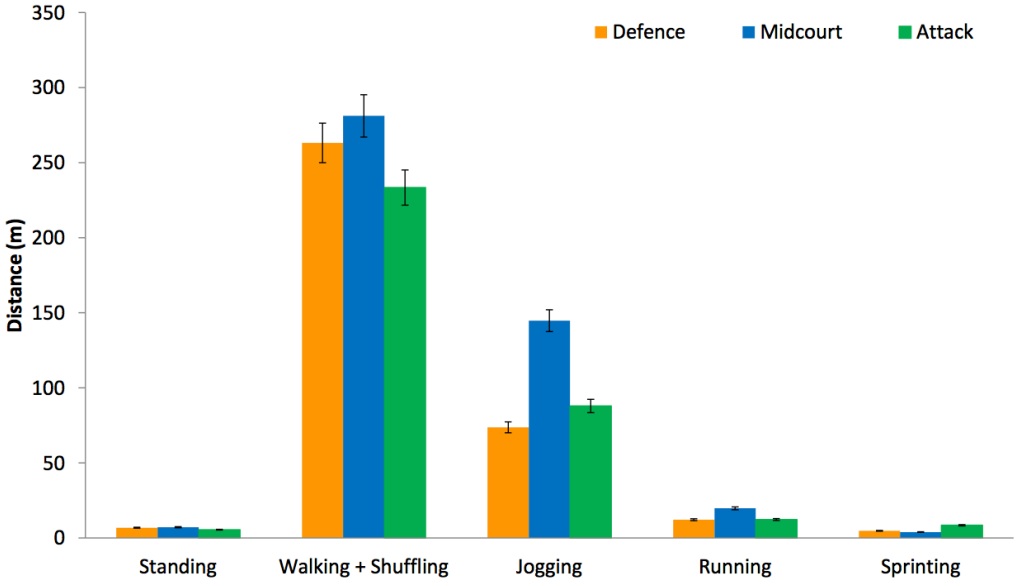

Figure 2. GPS data: distance covered per quarter by movement classification, mean ± SD

When comparing the mean frequency and duration of movements from the GPS and time-motion analysis, there was a discrepancy between the two methods. Of these differences, 16 demonstrated "very large" effect sizes.

Table 1. Comparison of mean frequency and duration of movements from the GPS and time-motion analysis (TMA)

	Frequency Per Quarter			Duration Per Quarter		
	Mean ± SD		ES; ±90% CI	Mean ± SD		ES; ±90% CI
	GPS	TMA		GPS	TMA	
Defence						
Standing	-	-	-	188.3 ± 78	146.8 ± 50.9	0.6; ±1.7
Walking + Shuffling	65.8 ± 9.4	82.8 ± 4.8	2.3; ±0.7	354 ± 66.8	356.4 ± 49	0; ±1.4
Jogging	14.2 ± 7.2	20.5 ± 5.5	1; ±1	56.7 ± 33.6	54.9 ± 12.3	0.1; ±1.5
Running	1 ± 1.2	17.8 ± 3.3	6.9; ±0.3	2.1 ± 2	37.3 ± 7.6	6.4; ±0.3
Sprinting	0.3 ± 0.5	8.3 ± 3	3.8; ±0.5	0.4 ± 0.5	11.1 ± 4.7	3.2; ±0.6
Midcourt						
Standing	-	-	-	155 ± 83.5	126.5 ± 16.3	0.5; ±1.7
Walking + Shuffling	61.8 ± 12.3	90.3 ± 4.2	3.1; ±0.6	363.9 ± 71.7	307.9 ± 16.3	1.1; ±2
Jogging	15.3 ± 8.4	41.3 ± 4.5	3.9; ±0.5	75.8 ± 61.8	95.9 ± 17.1	0.4; ±1.2
Running	3 ± 4.2	32.2 ± 3.3	7.8; ±0.3	5.7 ± 8.5	59.7 ± 14.6	4.6; ±0.5
Sprinting	1.3 ± 2.3	9.2 ± 1.3	4.3; ±0.5	2.6 ± 4.9	15.1 ± 2.7	3.2; ±0.6
Attack						
Standing	-	-	-	150.3 ± 71.1	184.5 ± 42.5	0.6; ±1.2
Walking + Shuffling	59 ± 7.5	78.8 ± 7.3	2.7; ±0.7	356.2 ± 41.3	313.6 ± 37.2	1.1; ±2
Jogging	17.6 ± 7.6	19.8 ± 2	0.4; ±1.3	85.5 ± 45.2	43.6 ± 10.6	1.3; ±2.1
Running	4.7 ± 4.1	26.5 ± 1.5	7.1; ±0.3	8.9 ± 8	50 ± 7.4	5.4; ±0.4
Sprinting	1.1 ± 1.6	10.8 ± 1	7.4; ±0.3	1.8 ± 2.7	13.5 ± 3.1	4; ±0.5

DISCUSSION

The results from this study suggest that in adolescent netball, Midcourt players cover the greatest distance per quarter, while Attacking players cover the greatest distance through sprinting, travelling nearly twice the distance of the other two groups. An explanation is that the velocity thresholds for the movement classifications were based on individual sprint times recorded over 10 m before the start of the study. These times were slightly faster for the Midcourt group (1.96 ± 0.1 s) compared to the Attacking group (2.07 ± 0.1 s), which may have resulted in more sprints being recorded for the Attacking group.

When comparing the mean frequency of movements from the GPS and time-motion analysis, there was a notable discrepancy between the two methods. In all cases the data from the GPS units appeared to under report the frequency of movement compared to the time-motion analysis. This suggests that the GPS units utilised in this study were unable to accurately capture the short duration movements found in netball.

While GPS units are useful for providing data such as total distance covered, time-motion analysis is still the preferred method to capture data on the intensity of movement in netball. However, this may change with GPS units that provide sample rates of 10 Hz or 15 Hz.

Overall, the frequency and duration of movements from the time-motion analysis were comparable to a study of Australian international netballers (Fox et al., 2013). This could be expected due to the consistent court size and positional constraints on movement found in netball. The adolescent netball players appeared to carry out more running and sprinting efforts than the elite players. This may be due to shorter quarter lengths in adolescent netball (10 min) compared to elite netball (15 min), meaning that the adolescent players are not required to conserve as much energy. Equally this may reflect the elite players' superior understanding of when to time their attacking runs and when to hold position. The elite player's demonstrated higher durations of shuffling, suggesting that they are more adept at using lateral movement to create or deny space.

CONCLUSIONS

The results from this study suggest that in adolescent netball Midcourt players cover the greatest distance per quarter while Attacking players cover the greatest distance through sprinting. However, a comparison between data from the GPS and time-motion analysis suggest that the GPS units used in this study under report the frequency and duration of high intensity movements. For this reason video-based time-motion analysis is still the preferred method to classify the intensity of movement in netball. The mean frequency and duration of activity from the time-motion analysis of adolescent netballers was comparable to that of elite netballers (Fox et al., 2013). This similarity may be due to the consistent court size and positional constraints on movement found in netball.

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