

# THE INFLUENCE OF CONTEXTUAL FACTORS ON RUNNING PERFORMANCE IN FEMALE AUSTRALIAN FOOTBALL MATCH-PLAY

GEORGIA M. BLACK,<sup>1</sup> TIM J. GABBETT,<sup>2,3</sup> GERALDINE NAUGHTON,<sup>4</sup> MICHAEL H. COLE,<sup>1</sup> RICH D. JOHNSTON,<sup>1</sup> AND BRIAN DAWSON<sup>5</sup>

<sup>1</sup>School of Exercise Science, Australian Catholic University, Brisbane, Queensland, Australia; <sup>2</sup>Gabbett Performance Solutions, Brisbane, Queensland, Australia; <sup>3</sup>Institute for Resilient Regions, University of Southern Queensland, Toowoomba, Queensland, Australia; <sup>4</sup>School of Exercise Science, Australian Catholic University, Melbourne, Victoria, Australia; and <sup>5</sup>Exercise Physiology and Biochemistry Department, University of Western Australia, Crawley, Western Australian, Australia

## ABSTRACT

Black, GM, Gabbett, TJ, Naughton, G, Cole, MH, Johnston, RD, and Dawson, B. The influence of contextual factors on running performance in female Australian football match-play. *J Strength Cond Res* 33(9): 2488–2495, 2019—Given the recent growth of the professional status among multiple female football codes, the aim of this study is to investigate the effects of contextual factors on activity profiles and pacing strategies in female Australian football (AF) players. Thirty-five female AF players participated in this study. Global positioning system analysis was completed over 1 competitive season. Matches were separated into eight 10-minute periods. Greater distances were covered during the first half irrespective of playing position (effect size [ES] = 0.39–0.50, Likelihood  $\geq$ 90%). Throughout a number of periods half-backs (defensive players) covered greater distances during losses (ES  $\geq$  0.74, Likelihood  $\geq$ 92%) and against top 3 opponents (ES  $\geq$  1.0, Likelihood  $\geq$ 97%). Midfielders and half-backs covered greater distances (ES  $\geq$  0.49, Likelihood  $\geq$ 89%) in the final match period in winning compared with losing matches. A reduction in player work rate is evident during the second half of matches. The influence of contextual factors varied across positional groups. However, it is clear that coaches could use player rotation both early in the match in an attempt to delay the effect of fatigue and more frequently during the second half to increase running intensity.

**KEY WORDS** pacing strategies, player work rate, global positioning systems, match outcome, opposition rank

Address correspondence to Georgia M. Black, georgia.black@acu.edu.au  
33(9)/2488–2495

*Journal of Strength and Conditioning Research*  
© 2017 National Strength and Conditioning Association

## INTRODUCTION

The recent development of a national female Australian football (AF) tournament has resulted in a rapid growth of the sport and highlighted the lack of available research concerning the activity profiles of female AF match-play. Although it has been established that activity profiles in team sports can be influenced by numerous contextual factors (11,20), the effect of these factors on female AF players is yet to be investigated. In elite male AF matches, total and high-speed distances covered decline from the first to the fourth match quarter (6). In partial agreement with these results, reduced high-speed activity has been reported as matches progressed without changes in total distance covered across the 4 match quarters (20). Although the importance of high-speed activity has been documented (16), there is a paucity of evidence providing associations between high-speed running and team success.

In elite soccer matches, total and high-speed running distances were greater when teams played higher quality opposition (7,18). Importantly, losing soccer teams covered greater distances than winning teams, with high-speed distances covered without the ball reported to be a distinctive indicator of soccer performance (7,18). Similar trends have emerged in women's rugby sevens match-play with greater total-, moderate-, and high-speed distances covered in matches against the top 4 opponents compared with the bottom 4 opponents (11). Furthermore, match activity profiles increased in elite male AF players (20) and women's rugby sevens (11) players in losing compared with winning matches. Interestingly, conflicting results have been reported in elite rugby league, where match demands were greater in winning than losing matches and when competing against lower ranked teams (9). It was suggested that the competitive advantage of successful elite rugby league teams was closely linked to their ability to maintain a higher playing intensity than losing teams. Clearly, the relationship between physical match activities and team success varies depending

on the sport in question and team style of play. As such, further studies need to be conducted to investigate the link between high-speed running and performance in team sports.

Although the effect of match results on overall match-play running performance is important, pacing strategies of winning and losing teams have also been explored (2,24). Pacing strategies are well-established in self-paced endurance events (21) and also occur in high-intensity intermittent team sports (2,24). Rugby league matches have been previously separated into eight 10-minute periods with players from winning teams setting a higher pacing strategy than players from losing teams, with a greater total distance and low-speed distance covered across all periods of the match (2). It was proposed that winning teams set a pacing strategy intended to win the match, while the pacing strategies of losing teams were established based on “survival.” However, interchanged players from losing teams demonstrated an “end-spurt” in the final stages of the match indicative of players increasing their work rates in an attempt to win the game (2).

Although variations in activity profiles between quarters have been investigated (19,20), to our knowledge, no research has examined the changes in running intensities within match quarters. Furthermore, as all AF research has been conducted on male performers, there is currently no evidence reporting pacing strategies used by female AF players across different match stages. Collectively, this highlights the need for research that further develops the understanding of the factors that influence running demands during female AF match-play and examines how match outcomes are influenced by the pacing strategy that is implemented. Therefore, the aim of this study was to identify differences in pacing strategies and activity profiles among female AF match-play, based on game outcome and opponent rank.

## METHODS

### Experimental Approach to the Problem

This study used a longitudinal and observational study design to analyze the pacing strategies of female AF players from 3 teams in the 6-team Queensland AF competition. Each 20-minute quarter was divided into two 10-minute blocks so that each player had 8 periods by the end of the match. Data collected during each match were subdivided into (11) winning and losing matches and (20) matches played against the top 3 opponents and bottom 3 opponents based on final ladder position.

### Subjects

Thirty-five players from the 3 teams competing in the Queensland Women's Australian Football (QWAFL) recreational league (mean  $\pm$  SD age, 23.7  $\pm$  5.3 years; height, 167.7  $\pm$  4.4 cm; body mass, 67.3  $\pm$  11.2 kg; Yo-Yo Intermittent Recovery 1 distance, 632  $\pm$  255 m; senior playing experience, 3.2  $\pm$  2.0 years) volunteered to participate this study.

The teams included in this study were the top 3 performing teams at the end of the season of interest. Before the study, all players received an information sheet outlining the experimental procedures and the risks and benefits associated with participation. This research was approved by The Australian Catholic University's Human Research Ethics board and all subjects were informed of the benefits and risks of the investigation before signing an institutionally approved informed consent document to participate in the study.

### Procedures

Global positioning system (GPS) analysis was completed during 14 matches (totaling 178 appearances) over the 2016 QWAFL season. Players were separated into midfield, half-back (defensive), and half-forward (attacking) positional groups. For the purpose of this study, full back/forwards, back/forward pockets, and ruckmen backs were excluded from the analysis as their activity profiles remained constant over 4 quarters. Data were removed if players were not on the field for at least 75% of the period. The midfield group was represented by 22 players ( $n$  = 51 winning files;  $n$  = 46 losing files;  $n$  = 60 top 3 opponent;  $n$  = 35 bottom 3 opponent). Half-backs consisted of 9 players ( $n$  = 24 winning files;  $n$  = 21 losing files;  $n$  = 30 top 3 opponent;  $n$  = 17 bottom 3 opponent). The half-forward group comprised 7 players ( $n$  = 20 winning files;  $n$  = 16 losing files;  $n$  = 23 top 3 opponent;  $n$  = 13 bottom 3 opponent). The average win/loss record for the teams included in this analysis was 12 wins (range: 9–14) and 4 losses (range: 2–7) across the season. Activity profiles were examined using GPS units (Catapult Sports, Docklands, VIC, Australia) sampling at 10 Hz. Acceptable validity and reliability of the GPS units (S5, Optimeye; Catapult Sports) used in this study have previously been reported (15). Before the warmup, the GPS unit was switched on and placed in a pouch of a specifically designed vest provided by the manufacturer so the unit was positioned on the upper-back, between the shoulder blades. Data were downloaded onto a laptop and analyzed using software provided by the manufacturer (Sprint, 5.1.7; Catapult Sports). Player activity profiles were determined using movement speeds corresponding to low-speed (0–2.78 m·s<sup>-1</sup>), moderate-speed (2.79–4.15 m·s<sup>-1</sup>), and high-speed (>4.15 m·s<sup>-1</sup>) bands (3). Only active field time was included in the analysis; data corresponding with players interchanging off the field were omitted.

### Statistical Analyses

The initial statistical approach involved linear mixed modeling to account for dependence arising from repeated measurements of performance variables from individual participants. A separate analysis was completed for game period, match result, and opposition rank as the fixed effect in each model, respectively. The random effect of player identity was included in each analysis. Based on the practical application of the results, data were further analyzed using Cohen's effect size (ES) statistic (5),

likelihoods, and 90% confidence intervals (CIs). The likelihood of a difference between groups equal to or greater than the smallest worthwhile change was estimated as  $0.2 \times$  between-subjects *SD* (small ES). The magnitude of difference was considered practically meaningful when the likelihood was  $\geq 75\%$ . The magnitude of differences were then assessed with ESs of  $\leq 0.2$ , 0.21–0.6, 0.61–1.2, 1.21–2.0, and  $> 2.0$  considered trivial, small, moderate, large, and very large, respectively (12). A custom Excel spreadsheet (Version 16, Microsoft) was used to report ES and CIs (12). All data were reported as mean  $\pm$  *SD* and the significance level was set at  $p \leq 0.05$ .

## RESULTS

### Activity Profiles Across Match

The average total game demands for each positional group are reported in Table 1. Across all positional groups, match demands were greater in the first half than the second half of match-play (ES = 0.39–0.50 [90% CI: 0.24–1.07], Likelihood 90–99%,  $p \leq 0.01$ ) (Figure 1A–C). For midfielders, greater relative-speed distances (ES  $\geq 0.69$  [90% CI: 0.43–1.07], Likelihood = almost certainly, 100%,  $p \leq 0.001$ ) and moderate-speed distances (ES  $\geq 0.53$  [90% CI: 0.26–0.93], Likelihood 98–100%,  $p \leq 0.001$ ) were covered during the first and third 10-minute periods compared with periods 2 and 4. High-speed distances were greater for midfielders in period 1 than period 2 (ES = 0.51 [90% CI: 0.24–0.78], Likelihood = very likely, 97%,  $p = 0.002$ ). In the second half (i.e., periods 5–8), no differences were observed in distances covered by this group (ES  $\leq 0.24$  [90% CI: –0.10 to 0.52], Likelihood  $\leq 65\%$ ,  $p \geq 0.850$ ). By contrast, running performances for half-forwards and half-backs were constant throughout the match (periods 1–8) (ES  $\leq 0.13$  [90% CI: –0.19 to 0.46], Likelihood  $\leq 59\%$ ,  $p \geq 0.639$ ). Furthermore, low-speed distances were similar throughout the match for all positional groups (ES  $\leq 0.16$  [90% CI: –0.33 to 0.65], Likelihood  $\leq 45\%$ ,  $p \geq 0.940$ ).

### Opposition Ranking

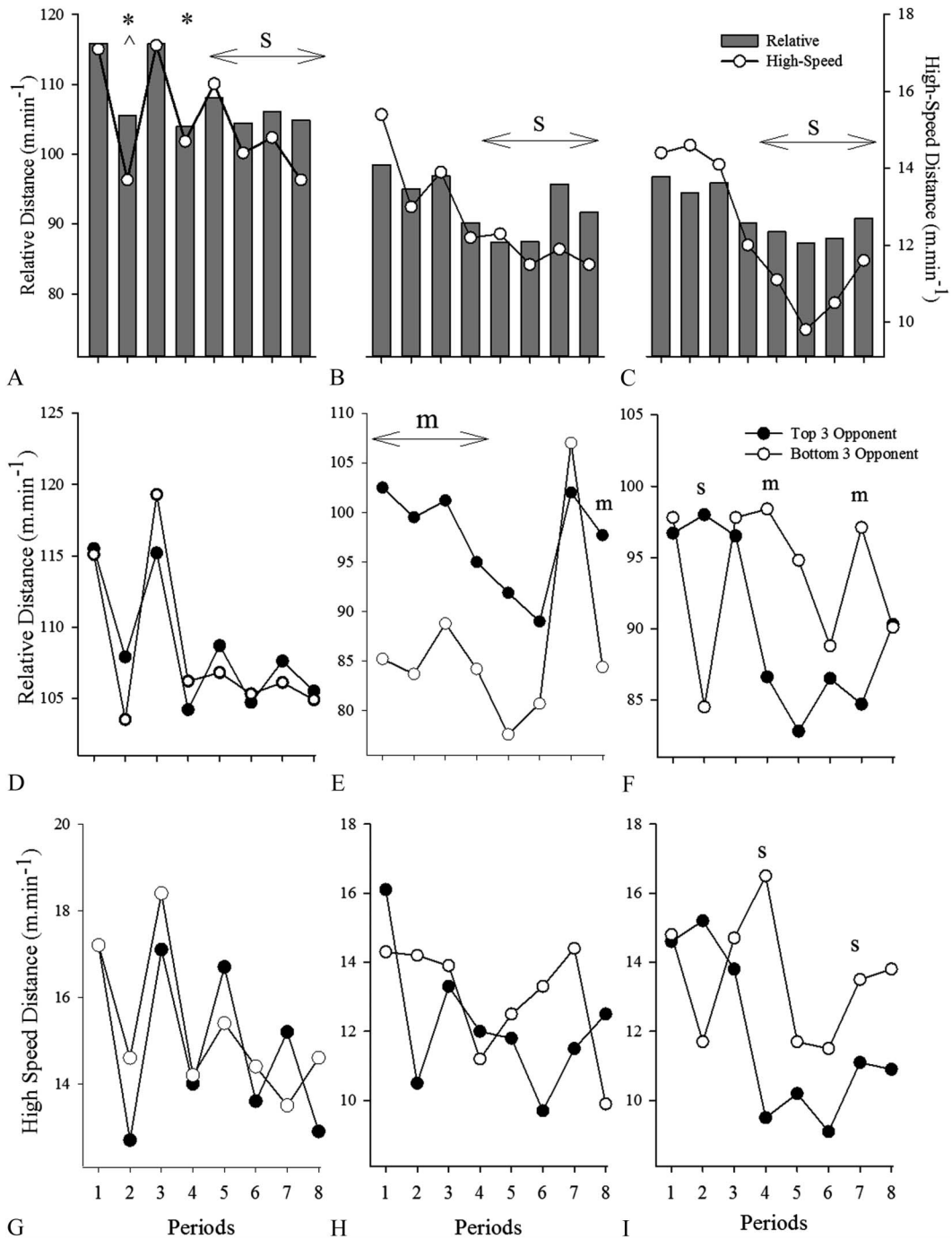
Midfielders spent a greater time on field ( $9.9 \pm 0.02$  vs.  $9.3 \pm 1.5$  minutes; ES  $\geq 0.59$  [90% CI: 0.14–1.30], Likelihood 92–97%,  $p \leq 0.04$ ) and covered greater total distances ( $1,101.3 \pm 56.2$  vs.  $1,009.4 \pm 95.5$  m; ES  $\geq 0.44$  [90% CI: 0.03–1.10], Likelihood 87–100%,  $p \leq 0.02$ ) during periods 1–3 when playing top-ranked teams compared with bottom ranked opposition. Midfielders' relative distance remained constant independent of opposition ranking (ES  $\leq 0.10$  [90% CI: –0.34 to 0.40], Likelihood  $\leq 50\%$ ,  $p \geq 0.196$ ). Half-backs covered similar high-speed distances across 8 periods, independent of opposition ranking (ES  $\leq 0.15$  [90% CI: –0.73 to 0.82], Likelihood  $\leq 44\%$ ,  $p \geq 0.131$ ). From period 1 to period 4, half-backs covered greater relative distances than other positions when playing higher quality opposition (ES  $\geq 1.0$  [90% CI: 0.29–1.80], Likelihood 97–99%,  $p \leq 0.01$ ) (Figure 1). The greater first half demands of the half-backs against top-ranked opponents were matched by a greater amount of distance covered at low speed (ES  $\geq 1.1$  [90% CI: 0.37–2.0], Likelihood 98–100%,  $p \leq 0.007$ ) and moderate speed (ES  $\geq 0.67$  [90% CI: 0.03–1.51], Likelihood 87–98%,  $p \leq 0.05$ ). During the final match period, half-backs covered greater relative distances (ES = 0.94 [90% CI: 0.22–1.67], Likelihood = very likely, 95%,  $p = 0.02$ ) and low-speed distances (ES = 0.77 [90% CI: 0.08–1.15], Likelihood = likely probable, 92%,  $p = 0.05$ ) when competing against higher-ranked opponents.

Although not statistically significant ( $p = 0.07$ ), half-forwards covered meaningfully greater relative distances during period 2 against top-ranked opponents (ES = 0.56 [90% CI: 0.08–1.43], Likelihood = likely probable, 80%). During period 4 (ES = 0.73 [90% CI: –0.05 to 1.43], Likelihood = likely probable, 90%,  $p = 0.05$ ) and period 7 (ES = 0.68 [90% CI: 0.08–1.68], Likelihood = likely probable, 91%,  $p = 0.05$ ), half-forwards covered greater relative distances against higher standard teams than lower ranked opposition teams (Figure 1). These differences were matched by greater distances covered at high-speed against higher-ranked

**TABLE 1.** Average match demands of female Australian Football match-play.\*

	Midfielders	Half-backs	Half-forwards
Field time (min)	75 $\pm$ 7	78 $\pm$ 5	74 $\pm$ 8
Total distance (m)	8,087 $\pm$ 895	7,167 $\pm$ 1,330	6,706 $\pm$ 934
Relative distance (m·min <sup>-1</sup> )	109 $\pm$ 10	92 $\pm$ 15	91 $\pm$ 15
Low-speed distance (m)	4,336 $\pm$ 593	4,278 $\pm$ 471	4,056 $\pm$ 643
Relative low-speed distance (m·min <sup>-1</sup> )	58 $\pm$ 5	55 $\pm$ 5	55 $\pm$ 5
Moderate-speed distance (m)	2,682 $\pm$ 669	1,915 $\pm$ 688	1,780 $\pm$ 404
Relative moderate-speed distance (m·min <sup>-1</sup> )	36 $\pm$ 9	25 $\pm$ 8	24 $\pm$ 6
High-speed distance (m)	1,065 $\pm$ 341	972 $\pm$ 413	870 $\pm$ 228
Relative high-speed distance (m·min <sup>-1</sup> )	15 $\pm$ 5	12 $\pm$ 5	12 $\pm$ 3

\*Data reported as mean  $\pm$  *SD*.



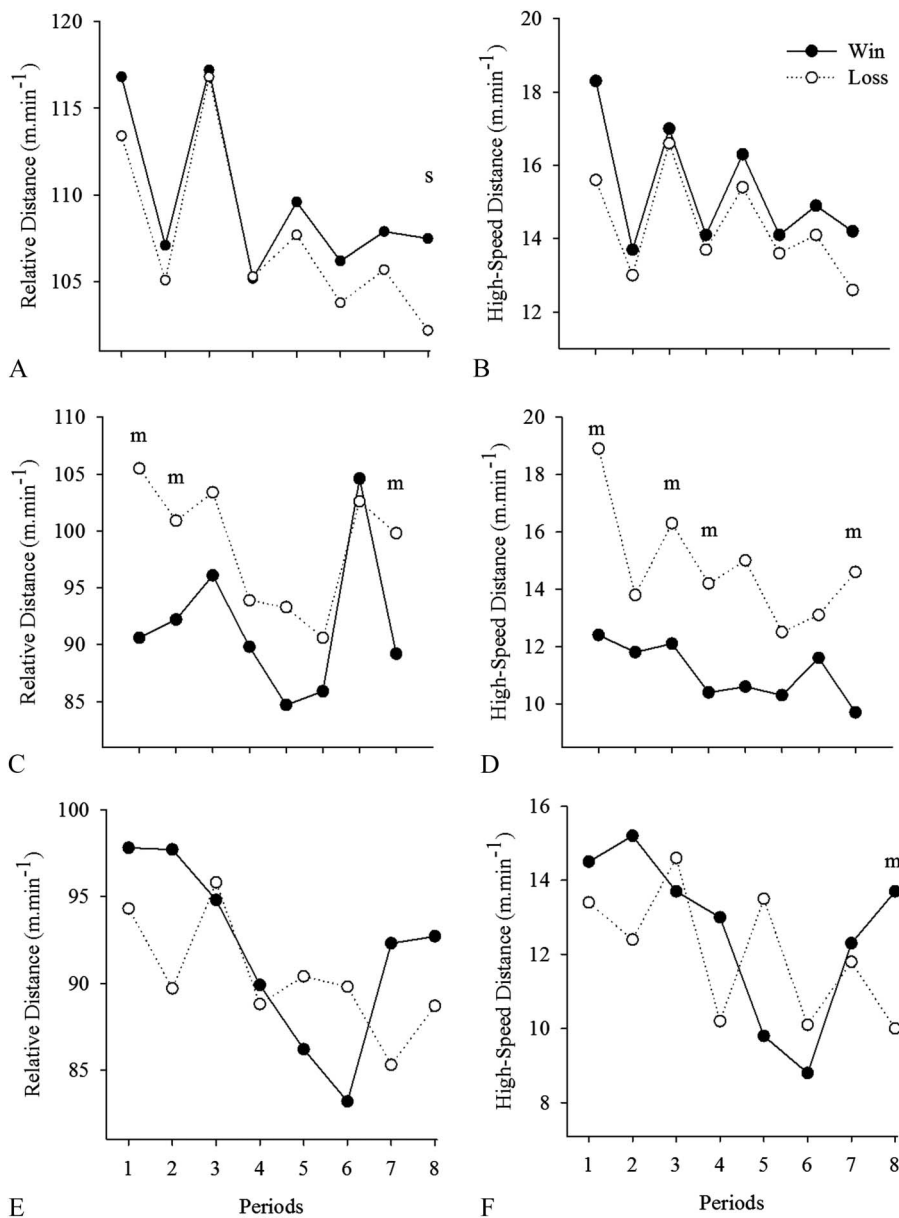
**Figure 1.** Work rates of midfielders, half-backs, and half-forwards across 8 match periods. A) Relative and high-speed distances covered by midfielders; (B) relative and high-speed distances covered by half-backs; (C) relative and high-speed distances covered by half-forwards; (D) relative distances covered by midfielders against top 3 and bottom 3 opponents; (E) relative distances covered by half-backs against top 3 and bottom 3 opponents; (F) relative distances covered by half-forwards against top 3 and bottom 3 opponents; (G) high-speed distances covered by midfielders against top 3 and bottom 3 opponents; (H) high-speed distances covered by half-backs against top 3 and bottom 3 opponents; (I) high-speed distances covered by half-forwards against top 3 and bottom 3 opponents. "S" denotes small effect size (ES) difference in relative distance covered compared with first half; \* denotes significant difference in relative distance compared with previous quarter; ^ denotes significant difference in high-speed distance compared with previous quarter; "s" denotes small ES difference (0.21–0.60) between top and bottom 3 opponents; "m" denotes moderate ES difference (0.61–1.19) between top and bottom 3 opponents.

opponents (ES  $\geq 0.54$  [90% CI: 0.03–1.48], Likelihood 82–91%,  $p \leq 0.05$ ).

**Game Result**

Figure 2 shows the influence of match outcome (winning vs. losing) on relative and high-speed distances covered by midfielders, half-backs, and half-forwards. High-speed activity remained unchanged across a match in midfielders ( $p \geq 0.351$ ).

Winning midfielders covered greater relative-speed distances (ES = 0.49 [90% CI: 0.11–0.87], Likelihood = likely probable, 89%,  $p = 0.05$ ) and moderate-speed distances (ES = 0.54 [90% CI: 0.13–0.89], Likelihood = likely probable, 91%,  $p = 0.03$ ) than losing midfielders in the final match period. Losing half-backs had a higher running intensity than winning half-backs across a number of match periods. During period 1 (ES = 0.95 [90% CI: 0.35–1.54], Likelihood = very likely, 98%,  $p = 0.03$ ),



**Figure 2.** Comparison of work rates of midfielders, half-backs, and half-forwards during matches won and matches lost. A) Midfielders relative distance covered; (B) midfielders high-speed distance covered; (C) half-back relative distance covered; (D) half-back high-speed distance covered; (E) half-forward relative distance covered; (F) half-forward high-speed distance covered; "s" denotes small effect size (ES) difference (0.21–0.60) between matches won and lost; "m" denotes moderate ES difference (0.61–1.19) between matches won and lost.

period 2 (ES = 0.87 [90% CI: 0.31–1.43], Likelihood = very likely, 97%,  $p = 0.210$ ) and period 8 (ES = 0.74 [90% CI: 0.11–1.37], Likelihood = likely probable, 92%,  $p = 0.141$ ) of matches, losing half-backs covered meaningfully greater relative distances than in winning matches. They also covered greater high-speed distances in losing matches during period 1 (ES = 0.90 [90% CI: 0.25–1.54], Likelihood = very likely, 96%,  $p = 0.03$ ), period 3 (ES = 1.06 [90% CI: 0.39–1.50], Likelihood = very likely, 98%,  $p = 0.05$ ), period 4 (ES = 0.94 [90% CI: 0.07–1.43], Likelihood = very likely, 98%,  $p = 0.05$ ) and period 8 (ES = 0.75 [90% CI: 0.07–1.43], Likelihood = likely probable, 91%,  $p = 0.06$ ) than in winning matches. For half-forwards, physical match demands were similar across the 8 periods regardless of match result ( $p \geq 0.454$ ), with the exception of period 8, where these players covered greater high-speed distances in matches won than matches lost (ES = 0.89 [90% CI: 0.25–1.53], Likelihood = very likely, 96%,  $p = 0.02$ ).

## DISCUSSION

This is the first study to investigate the influence of contextual factors (game period, opponent rank, and game outcome) on the activity profiles and pacing strategies of female AF players. Despite all positional activity profiles being reduced after the first half of match-play (periods 1–4), the influence of other contextual factors varied across positional groups. Matches against higher standard opposition led to greater game intensity in half-back/forward players irrespective of match outcome. Half-backs were the only positional group for whom game outcome altered running performance over several match periods. However, during the final period of the total match, midfielders, and half-forwards produced a higher work rate in winning rather than losing matches. These findings suggest that activity profiles, and more specifically pacing strategies, differ across positional groups and are dependent on game outcome and the quality of opposition players.

Match running performance was greater during the first half of match-play for all positional groups, which is consistent with other team sport research (4,7) that has demonstrated decreased match intensity across halves. Collectively, these results are suggestive of match-related fatigue (7) and imply that team sport athletes often adopt high intensity during the first half of play that is not sustainable for the entire match. Notwithstanding, players may have elicited this positive pacing strategy (22) in an effort to dominate their opposition and perhaps gain an early match lead on the scoreboard. This finding is in agreement with previous performance profiles of an initial high work rate followed by a reduction in activity within the middle section of an event during prolonged duration activities (22). During the second half, it is hypothesized that pacing strategies are adjusted in attempt to reduce the effect of match-related fatigue.

This is the first study to separate AF matches into 8 match periods. Our findings highlighted an “all-out” or “positive”

pacing strategy (23) being implemented by female AF midfielders during the first 2 quarters. It is possible that at the onset of quarters 1 and 2, midfielders used a higher work rate with the knowledge they may be interchanged at some point during the quarter (23). As the quarter progressed, match intensity decreased, which may suggest that these players implemented a pacing strategy that they were unable to sustain. Alternatively, in considering the positive association between rotations and match running performance (17), the observed decline in work rate during the latter stages of the game may suggest that midfielders were not rotated regularly enough, leading to increased player fatigue. Further research investigating the influence of rotation number on running performance in female AF players is warranted.

In contrast to the midfield group, both half-backs and half-forwards maintained running intensity within each match quarter. A possible explanation for this finding is that the midfield group covered approximately 20% greater relative distances during a match than other positional groups. Therefore, the less demanding nature of match-play in the half-back and half-forward positional groups may elicit less fatigue, which allows these players to maintain a consistent running performance within quarters.

One interesting finding from this study was that reductions in match intensity were not due to reductions in low-speed activity. Across the 8 periods, low-speed distances remained unchanged for all positional groups. While this result is consistent with findings from 1 elite AF study (1), most research to date has suggested low-speed activity is reduced in attempt to maintain high-speed activity (8,10,14). This may be due to poorly developed physical qualities in which players exhibit a larger fatigue response and further results in greater reductions in activity profiles (14).

The influence of opposition ranking varied considerably across positional groups. Greater field time and total distances were recorded for midfielders when playing against higher quality opposition. However, relative match distances were similar irrespective of opposition ranking across all match periods. Given that match intensity was comparable in games regardless of opposition quality, coaches could aim to rotate midfielders more frequently throughout quarters when playing against Top 3 competitors in attempt to increase player work rate during these matches. During 5 of 8 periods, half-backs worked at a greater intensity during games against top 3 opponents. These results are similar to those found in women’s Rugby Sevens (11) whose activity profiles increased when competing against higher quality opposition. Interestingly, no differences were reported in running performance between different quality opposition in half-forwards. This finding is difficult to reconcile, although it is possible that differences lie in the number of skill involvements in this positional group between high- and low-standard opposition (18). However, it may also be that this positional group’s ability to find space and “lead” for the football is not influenced by opposition quality.

The half-back positional group exhibited a higher work rate in losing than winning matches. A plausible explanation is that when losing, this positional group is under a greater amount of defensive pressure and subsequently match intensity is increased. As has been previously suggested (20), it may be important to consider strategies of rotating this positional group into a back-pocket position or off the field for short periods of time when losing matches to ensure that they can withstand defensive pressures throughout the match. While the activity profiles of half-backs were greater when losing than winning, contrasting results were demonstrated in the midfield and half-forward positional groups. For 7 of the 8 match periods analyzed over each match, no differences were reported between winning and losing midfielders and half-forwards. Consistent with some (13), but not all research (16), our results highlight that an ability to cover greater distances is not necessarily indicative of match success. This finding is not surprising given that previous research (20) has suggested that match success is more dependent on skill involvement and efficiency than greater activity profiles in elite male AF players. However, during the period, when matches were won, these positional groups exhibited an “end-spurt” and covered greater distances compared with losing players. While this finding is in disagreement with previous research (2), it is suggested that rather than lowering physical work rate in the final match stage, perhaps these players finally gained a competitive match edge that allowed them to find space from their opposing players and increase their running intensity.

Although this study is the first to investigate the influence of contextual factors on running performance in AF match-play, a limitation of this research was the relatively small sample size. It should be noted that all participants were recruited from 1 recreational competition and therefore may not be representative of all female AF players. Furthermore, only the 3 top teams in the competition took part in this study so the influence of opposition may differ from bottom placed teams.

The findings of this study demonstrate that running performance was influenced by match period, quality of opposition, and game results in female AF match-play. All positional groups decreased running intensity during the second half of the match. However, midfielders were more affected by match-related fatigue than other positional groups. Half-backs were the only positional group in whom running intensities were affected by game result and opposition ranking. Greater match intensities were exhibited by half-backs when losing and during matches against higher quality opposition, most likely as a result of greater defensive pressures during these games. This research highlights the importance of understanding contextual factors, and the magnitude of these factors on activity profiles in female AF players in all levels of competition.

#### PRACTICAL APPLICATIONS

Across all positional groups, match-related fatigue resulted in a reduction of player work rate during the second half of

matches. Coaches could use player rotations early in the match in an attempt to delay the effect of fatigue, especially in the midfield positional group. Moreover, coaches could aim to rotate players more frequently in the second half to allow players to work at a higher match intensity for shorter periods of time.

High-speed running was relatively unaltered by match conditions in this population. However, to aid in the advancement of these players and the women’s game, training could focus on developing high-speed running performance and exposing players to high-speed activities in attempt to delay the onset of fatigue.

Greater activity profiles during losses and when competing against high-quality opposition should be taken into consideration when programming recovery and subsequent training, particularly in the half-back players.

#### ACKNOWLEDGMENTS

The authors would like to thank the players and staff involved in the Queensland Women’s Australian Football League competition for participating in this project. The authors have no conflicts of interest to disclose.

#### REFERENCES

1. Aughey, RJ. Australian Football player work rate: Evidence of fatigue and pacing? *Int J Sports Physiol Perform* 5: 394–405, 2010.
2. Black, GM and Gabbett, TJ. Match intensity and pacing strategies in rugby league: An examination of whole-game and interchanged players, and winning and losing teams. *J Strength Cond Res* 28: 1507–1516, 2014.
3. Black, GM, Gabbett, TJ, Naughton, GA, and McLean, BD. The effect of intense exercise periods on physical and technical performance during elite Australian football match-play: A comparison of experienced and less experienced players. *J Sci Med Sport* 19: 596–602, 2016.
4. Brewer, C, Dawson, B, Heasman, J, Stewart, G, and Cormack, S. Movement pattern comparisons in elite (AFL) and sub-elite (WAFL) Australian football games using GPS. *J Sci Med Sport* 13: 618–623, 2010.
5. Cohen, J. *Statistical Power Analysis for the Behavioural Sciences*. (2nd ed.). New York, NY: Academic Press, 1988.
6. Coutts, AJ, Quinn, J, Hocking, J, Castagna, C, and Rampinini, E. Match running performance in elite Australian Rules football. *J Sci Med Sport* 13: 543–548, 2010.
7. Di Salvo, V, Gregson, W, Atkinson, G, Tordoff, P, and Drust, B. Analysis of high intensity activity in Premier league soccer. *Int J Sports Med* 30: 205–212, 2009.
8. Duffield, R, Coutts, AJ, and Quinn, J. Core temperature responses and match running performance during intermittent-sprint exercise competition in warm conditions. *J Strength Cond Res* 23: 1238–1244, 2009.
9. Gabbett, TJ. Influence of the opposing team on the physical demands of elite Rugby League match play. *J Strength Cond Res* 27: 1629–1635, 2013.
10. Gabbett, TJ, Wiig, H, and Spencer, M. Repeated high-intensity running and sprinting in elite women’s Soccer competition. *Int J Sports Physiol Perform* 8: 130–138, 2013.
11. Goodale, TL, Gabbett, TJ, Tsai, MC, Stellingwerff, TS, and Sheppard, J. The effect of contextual factors on physiological and activity profiles in international women’s Rugby Sevens. *Int J Sports Physiol Perform* 24: 1–21, 2016.

12. Hopkins, W, Marshall, S, Batterham, A, and Hanin, J. Progressive statistics for studies in sports medicine and exercise science. *Med Sci Sports Exerc* 41: 3–13, 2009.
13. Hulin, BT and Gabbett, TJ. Activity profiles of successful and less-successful semi-elite Rugby League teams. *Int J Sports Med* 36: 485–489, 2015.
14. Johnston, RD, Gabbett, TJ, and Jenkins, DG. The influence of physical fitness and playing standard on pacing strategies during a team-sport tournament. *Int J Sports Physiol Perform* 10: 1001–1008, 2015.
15. Johnston, RJ, Watsford, ML, Kelly, SJ, Pine, MJ, and Spurrs, RW. Validity and interunit reliability of 10 Hz and 15 Hz GPS units for assessing athlete movement demands. *J Strength Cond Res* 28: 1649–1655, 2014.
16. Mohr, M, Krstrup, P, and Bangsbo, J. Match performance of high-standard soccer players with special reference to development of fatigue. *J Sports Sci* 21: 519, 2003.
17. Mooney, M, Cormack, S, O'Brien, B, and Coutts, AJ. Do physical capacity and interchange rest periods influence match exercise-intensity profile in Australian Football? *Int J Sports Physiol Perform* 8: 165–172, 2013.
18. Rampinini, E, Impellizzeri, FM, Castagna, C, Coutts, AJ, and Wisløff, U. Technical performance during soccer matches of the Italian Serie A league: Effect of fatigue and competitive level. *J Sci Med Sport* 12: 227–233, 2009.
19. Sullivan, C, Bilsborough, JC, Cianciosi, M, Hocking, J, Cordy, JT, and Coutts, AJ. Factors affecting match performance in professional Australian Football. *Int J Sports Physiol Perform* 9: 561–566, 2014.
20. Sullivan, C, Bilsborough, JC, Cianciosi, M, Hocking, J, Cordy, J, and Coutts, AJ. Match score affects activity profile and skill performance in professional Australian football players. *J Sci Med Sport* 17: 326–331, 2014.
21. Tan, PLS, Tan, FHY, and Bosch, AN. Similarities and differences in pacing patterns in a 161-km and 101-km ultra-distance road race. *J Strength Cond Res* 30: 2145–2155, 2016.
22. Tucker, R. The physiological regulation of pacing strategy during exercise: A critical review. *Br J Sports Med* 43: e1, 2009.
23. Waldron, M and Highton, J. Fatigue and pacing in high-intensity intermittent team sport: An update. *Sports Med* 44: 1645–1658, 2014.
24. Waldron, M, Highton, J, Daniels, M, and Twist, C. Preliminary evidence of transient fatigue and pacing during interchanges in Rugby League. *Int J Sports Physiol Perform* 8: 157–164, 2013.