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The influence of physical qualities on activity profiles of female Australian Football match play

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RUNNING HEAD: Match demands of female Australian football

Title: The influence of physical qualities on activity profiles of female Australian football match-play

Abstract

Purpose: The rapid transition of female Australian football players from amateur to semi-elite competitions has the potential for athletes to be underprepared for match-play. To gain an understanding the match demands of female football, the aims of this study were three-fold: (1) to highlight the physical qualities that discriminate selected and non-selected female Australian Football players, (2) to investigate activity profiles of female Australian Football players, and (3) to gain an understanding of the influence of physical qualities on running performance in female Australian Football match-play.

Methods: Twenty-two female Australian football (AF) state academy players (mean ± SD age, 23.2 ± 4.5 years) and 27 non-selected players (mean ± SD age, 23.4 ± 4.9 years) participated in this study. The Yo-Yo Intermittent Recovery Test (Level 1), countermovement jump and 30m sprint tests were completed prior to the competitive season. During 14 matches, players wore global positioning system (GPS) units to describe the running demands of female AF match-play.

Results: Selected players were faster over 30 metres (ES=0.57; p=0.04) and covered greater distances on the Yo-Yo IR1 test (ES=1.09; p<0.001). Selected midfielders spent greater time on the field and covered greater total distances (ES=0.73-0.85; p<0.009). No differences were reported in relative distances covered between selected and non-selected players (p=0.08). Players who were faster over 5 metres (r= -0.612), and 30-metres (r= -0.807) and performed better on the Yo-Yo IR1 (r=0.489) covered greater high-speed distances during match-play.

Conclusions: Selected female AF players were faster and had greater intermittent running ability than players not selected to a State academy program. An emphasis should be placed on the development of physical fitness in this playing group to ensure optimal preparation for the national competition.

Keywords: team sports, team selection, Yo-Yo test, sprint, global positioning system.

Introduction

Australian football (AF) is a high-intensity intermittent team sport that involves a combination of physical and technical components. Physical testing batteries are used to monitor the physical attributes of players throughout the season and have been used to discriminate high standard players from low standard players within multiple team sports.[1,2] Despite the importance of one's physical qualities to their playing standard, physical fitness tests also have the ability to predict team selection.[2,3] Compared with non-selected players, selected junior rugby league players were faster over 10-40 metres and demonstrated superior vertical jump and maximal aerobic power.[2] Similarly, individuals selected to play in elite men's AF teams covered greater distances on the Yo-Yo intermittent recovery test compared to non-selected players.[3] Furthermore, elite senior AF players selected for the first competitive game of the season were older and more experienced than the non-selected players.[3] In contrast, physical attributes are suggested to be less important for discriminating starters and non-starters in junior volleyball squads, while sport-specific skill qualities have been shown to be more important to a player's selection.[4] Collectively, these findings demonstrate that physical qualities are important to selection in most team sports, but it appears that the specific qualities contributing to team selection differs across sports.

Physical qualities of team sport athletes are known to be related to match running performance.[5,6,7] For example, maximum sprint velocity has been strongly linked to the amount of moderate- and high-speed running performed by semi-elite and recreational AF players.[8] Furthermore, separate studies have reported associations between intermittent-running ability and both high-speed and total distances covered during elite AF match-play.[9,10] While these studies provide some insight into the influence of different physical qualities on physical match performance, they have largely involved elite and sub-elite playing groups. Given these populations encompass only a small proportion of participants in sport, a need exists to further explore the demands of recreational team sports. Furthermore, despite growing evidence in support of the use of physical quality tests for discriminating selected male athletes from their non-selected counterparts, the evidence for the use of such assessments for female playing groups is far less substantive. Given the vast differences in physical preparation between male and female AF environments, there is a need to explore the influence of physical qualities on female AF team selection, and gain an understanding of which, if any, qualities require further development.

In accordance with research involving male athletes,[11] prolonged high-intensity running ability was associated with greater total and high-speed running distances in female soccer players.[12] Additionally, a small number of studies have reported positive relationships between the playing standard of female soccer players and their sprinting[13] and jumping[14] performance. Furthermore, it has been shown that female soccer players with faster sprints perform at a lower proportion (77%) of their maximal speed during matches than players with slower speed (84%),[15] which would likely have implications for the fatigability of these athletes. However, in contrast to the reported relationships between running ability and playing standard in female athletes, separate research[13] has reported similar countermovement jump performance for female soccer players competing at different levels. Although a number of physical qualities have been linked to performance in female team sports, to date, the research concerning the relationships between physical attributes and playing standards in female team sport athletes has been largely restricted to women's soccer. Additionally, the majority of AF research has focussed on male AF which is largely represented by a homogenous group of elite senior athletes. With the inaugural season of the

National Women's Australian Football League commencement in 2017, there is a clear need for research investigating the differences in physicality between selected and non-selected players and the importance of different physical qualities on match running performance in female Australian footballers. An understanding of the physical qualities important to team selection may substantially advance current practice in the National Women's League and other female football codes. Additionally, identifying the activity profiles of different positional groups should aid in the development of sport-specific training programs. Given the recent development of the National Women's League, the aims of this study are to (1) highlight the physical qualities that discriminate selected and non-selected female AF players, (2) investigate activity profiles of female AF players, and (3) gain an understanding of the influence of physical qualities on running performance in a state-level female AF competition.

Methods

Subjects

Twenty-two selected players (mean ± SD age, 23.2 ± 4.5 years; playing experience, 4.0 ± 2.8 years) and 27 non-selected players (mean ± SD age, 23.4 ± 4.9 years; playing experience, 2.1 ± 1.6 years) participated in this study. Three teams competing in the top division of the six team Queensland Women's Football League were recruited. Players selected into the state academy represented the "selected" group, while players who were not selected for the state academy formed the "non-selected" group. The state academy coaches had no knowledge of the results of the physical tests reported in this study prior to selection. The state academy participants competed for their individual Queensland Women's Australian Football League teams in the same competition as "non-selected" players when not on state representative duties. Before the study, all players provided written consent and the study was approved by the University's Human Ethics Review Board (2016-27H).

Design

An observational cohort study was used to investigate the influence of physical qualities on running demands in female AF players. Initial physical quality testing was completed at the end of preseason and activity profiles were measured using Global Positioning System (GPS) units during 14 matches. All participants completed two field sessions per week with their respective clubs during the preseason. This project was completed in three phases. Firstly, the sample was separated into selected and non-selected players, for the Queensland State Academy group. Secondly, the match activity profiles were obtained for three positional groups (midfielders n = 22 players; N = 97 match files, half-line players n= 16 players; N = 81 match files, and full-line players n = 11 players; N = 54 match files). Half-line players represented centre half-backs/forwards and half-backs/forwards. Full-line players represented full-backs/forwards and back/forward pockets. Finally, the relationship between physical qualities and activity profiles were determined using partial correlations, controlling for playing position.

Methodology

As part of preseason training for the competitive season, participants completed physical tests that included the: (1) countermovement jump (CMJ), (2) 30-metre sprint and (3) Yo-Yo Intermittent Recovery Test (level 1 [Yo-Yo IR1]). Testing was completed over two separate days, with the CMJ and the 30-metre sprint tests completed during the initial session and the Yo-Yo IR1 completed during a session scheduled two days later. Participants wore football boots and their normal training clothes. To limit the potential influence of diurnal factors, all

testing was completed outdoors on a grass playing field at the same time of day (~1900 hours); players were asked to avoid any exercise and to maintain their normal diet between testing sessions.

The CMJ was included to assess lower body power and was performed on a force platform[16] (Fitness Technology, 400 Series, Australia) interfaced with a laptop (Dell Latitude E7450, Dell, USA) running manufacturer designed software (Ballistic Measurement System, Australia). Before the assessment, players were familiarised with the procedures and performed a standardised warm-up consisting of dynamic stretches and plyometric exercises for the lower body. Players were instructed to keep their hands on their hips for the entire trial and to jump as high as possible. The players received no instruction as to the depth of the countermovement. Players performed 3 jumps separated by 60-seconds rest and the best performance was recorded as peak power. The typical error of measurement (TE) for the CMJ peak power measure was 4.1% for this population.

The 30-metre sprint test was performed cross-wind using dual-beam electronic timing gates (Swift Performance Equipment, New South Wales, Australia, TE=0.04s) and provided an assessment of running speed.[17] The starting gate was positioned 30 cm from the participant's front foot, with further gates then positioned at 5, 20 and 30 metres. The fastest of three 30 metre sprints was recorded. A three-minute recovery was allowed between sprints. Acceleration was calculated from the 0 to 512metre timing gates and peak velocity was noted between the 20 and 30 metre timing gates.

To assess prolonged high-intensity running ability, each player completed the Yo-Yo IR1. This test required players to perform 2 x 20-metre shuttles at progressively increasing speeds, controlled by a series of audible signals. Players were required to keep in time with the audible signal for as long as possible. Each 20-metre return run was interspersed with a 10-second active recovery, consisting of jogging around a cone placed 5 metres from the start/finish line. When players were unable to keep in time with 2 consecutive signals, they were removed from the test, the total distance covered was recorded as the Yo-Yo IR1 score. As players were unfamiliar with the test the first two levels were incorporated into the warm-up. The typical error of measurement for the Yo-Yo IR1 has been reported as 4.9%.[18]

Following the physical assessments, activity profiles were recorded for each participant using global positioning system (GPS) units during at least 4 competitive season matches (mean ± SD: 5.1 ± 0.6; range: 4 to 6; total GPS files: 232) played throughout the 2016 competitive season. Match activity profiles were obtained for three positional groups. Half-line players represented centre half-backs/forwards and half-backs/forwards. Full-line players represented full-backs/forwards and back/forward pockets. Prior to the match warm-up, players were fitted with a GPS unit sampling at 10Hz, which was placed in a pouch in the rear of a manufacturer designed vest positioned between the shoulder blades. The GPS units (S5, Optimeye, Catapult Sports, Docklands, VIC, Australia) used in this study have previously reported acceptable reliability (coefficient of variation [CV] = 3.1-8.3%) and validity (CV = 2.0-5.3%).[19] Data were downloaded to a laptop and analysed using software provided by the manufacturer (Sprint 5.1.7, Catapult Sports, Docklands, VIC, Australia). Player movement profiles were determined by sub-dividing movements into low-speed (0-2.78 $m.sec^{-1}$), moderate-speed (2.79-4.15 $m.sec^{-1}$), and high-speed (>4.15 $m.sec^{-1}$) movement bands.[20] Data were further divided by individual playing time and expressed as relative distances to give an

indication of overall player work rate. Only active field time was included in the analysis; data were removed for the time period players were rotated or interchanged off the field.

Statistical Analyses

Differences in physical qualities between selected and non-selected players were compared for null-hypothesis testing (SPSS 19.0, SPSS Inc, Chicago, IL, USA). Data were first tested for normality using a Shapiro Wilk test. Differences between groups were investigated using independent t-tests (normal data) or a Mann-Whitney U test (non-normal data). Statistically significant ($p<0.05$) physical quality variables were included in a linear discriminant analysis that aimed to determine which of the physical attributes contributed to selected or non-selected group classification. A regression equation was created that was used to predict whether a player would be included in the selected or non-selected group. A linear mixed model with a fixed effect for team selection and a random effect for individual player identity was used to examine each GPS variable. The random effect for player identity was included to account for the dependence arising from repeated measurements of running performance variables from individual participants. Differences were further compared using Cohen's effect sizes (ES)[21] and 90% confidence intervals (CI). Effect sizes of ≤0.2, 0.21–0.6, 0.61–1.2, 1.21–2.0, and >2.0 were considered trivial, small, moderate, large, and very large, respectively.[21] Magnitudes of differences between the two groups were classified as substantially greater or lesser when there was a ≥75% likelihood of the effect being equal to or greater than the smallest worthwhile change, estimated as 0.2 x between-subjects SD (small ES). A custom Excel spreadsheet was used to determine ES and confidence intervals.[22] Finally, partial correlations (controlling for playing position) were used to assess the association between the tests of physical qualities and activity profiles. Correlations of 0.0-0.1, 0.1-0.3, 0.3-0.5, 0.5-0.7, 0.7-0.9, 0.9-0.99, and 1.0 were considered trivial, small, moderate, large, very large, nearly perfect, and perfect, respectively.[22]

Results

Table 1 shows the descriptive characteristics for the selected and non-selected players. Selected players had more playing experience (ES=0.78 [90%CI: 0.23-1.33]; Likelihood = very likely, 96%; p=0.02), superior 30-metre sprint time (ES=0.57 [90%CI: 0.10-1.03]; Likelihood = likely probable, 90%; p=0.04), recorded a higher peak velocity between the 20-30m timing gates (ES=0.65 [90%CI: 0.19-1.11]; Likelihood = likely probable, 95%; p=0.03) and covered greater distances during the Yo-Yo IR1 (ES=1.09 [90%CI: 0.63-1.55]; Likelihood = almost certainly, 100%; $p<0.001$) than the non-selected players. No significant differences were recorded for the other physical qualities (ES≤0.37 [90%CI: -0.36-0.95]; p≥0.330).

Insert Table 1 About Here

The average squared canonical correlation of 0.521 showed that 2 variables accounted for 52.1% of the overall discrepancy between selected and non-selected players. The discriminant analysis correctly predicted 63.6% (14 of 22) of selected players and 81.5 % (22 of 27) of non-selected players, with an overall accuracy of 73.4% (36 of 49) for all athletes. The discriminant analysis equation is shown below:

(0.181 × peak velocity) + (0.004 × Yo-Yo IR1 distance) -3.738.

Comparisons of the activity profiles of selected and non-selected midfielders, half-line and full-line players are shown in Table 2. Selected midfielders spent 7.8% more time on the field (ES=0.85 [90%CI: 0.29121.41]; Likelihood = likely, probable, 93%; p=0.004) and covered 6.1% greater total match distances (ES=0.73 [90%CI: 0.21121.25], Likelihood = likely, probable, 92%; p=0.009) than non-selected midfielders. No other differences were found between midfield groups. There were no meaningful differences between selected and non-selected half- and full-line players (ES<0.44 [90%CI: 120.24120.86]; p≥0.08).

Insert Table 2 About Here

Both selected and non-selected midfielders covered greater relative- (ES≥1.13 [90%CI: 0.74-3.28]; Likelihood = almost certainly, 100%; p≤0.03) and moderate-speed (ES≥1.06 [90%CI: 0.62-2.32]; Likelihood = almost certainly, 100%; p<0.001) distances than half- and full-line players. There were no differences in high-speed running across positions in selected players (ES≤0.33 [90%CI: 0.04-0.69]; p≥0.924). Non-selected midfielders covered greater high-speed distances than non-selected half-line (ES=0.79 [90%CI: 0.30-1.27]; Likelihood = very likely, 98%; p=0.01) and full-line players (ES=1.21 [90%CI: 0.80-1.63]; Likelihood = almost certainly, 100%; p<0.001). Selected half-line players covered 15% greater relative- (ES=1.40 [90%CI: 0.50-2.30], Likelihood = very likely, 98%; p<0.001) and 16% greater low-speed (ES=1.28 [90%CI: 0.03-2.54]; Likelihood = likely, probable, 93%; p<0.001) distances than selected full-line players. Non-selected half-line players covered greater distances at all speeds than non-selected full-line players (ES≥0.85 [90%CI: 0.40-1.90]; Likelihood ≥ 99%; p<0.03).

The relationship between tests of physical qualities and match activity profiles, controlling for playing position, is shown in Table 3. High-speed distance covered during matches was related to faster 5-m (r = -0.612; p=0.012) and 30-m times (r = -0.807; p<0.001), as well as greater peak velocity (r = 0.775; p<0.001) and Yo-Yo IR1 performance (r = 0.489, p=0.05). Players who were faster over 30-metres (r = -0.496; p=0.05) covered greater relative match distances. No meaningful associations were found among any other physical quality and activity profiles (Table 3).

Insert Table 3 About Here

Discussion

This study investigated (1) the physical qualities that discriminate selected and non-selected female AF players, (2) the activity profiles of female AF players, and (3) the influence of physical qualities on running performance in female AF match-play. Consistent with research on junior elite male AF players,[1,11] selected female AF players were faster over 30 metres, had a higher peak velocity and superior prolonged high-intensity running ability. The greater prolonged high-intensity running ability and speed would likely enable selected players to place themselves in more advantageous positions to receive the ball during match-play. In partial agreement with previous research in elite senior male AF players,[3] the selected players were more experienced, however age did not influence team selection in this population. Acceleration, peak running speed and high-intensity running ability were all associated with greater high-speed running distances during match-play, suggesting that such physical attributes may influence team selection and match activity profiles in female AF players. Support for this notion was provided by the discriminant analysis, which showed that a combination of speed and high-intensity running ability are important in team selection of

female AF players. However, it is worth considering that the presented discriminant model was more successful at classifying players who were not selected in the Academy squad, suggesting that other factors, such as skill performance, may be better predictors of team selection in female AF players.[4] With this in mind, the inclusion of skill-based testing in future team selection processes warrants investigation.

The associations between speed and high-speed running distances during matches support the importance of running speed to a player's performance during female AF match-play, but the lack of relationships between lower body power and match running performances was unexpected. For male team sport athletes, both lower body power[23] and acceleration[3] have been shown to discriminate higher standard athletes from lower standard athletes and starting players from non-starting players. The absence of relationships between lower body power, acceleration and running performances in female AF players may have been influenced by the lack of access to training facilities and limited exposure to systematic strength and power training; potentially limiting their capacity to specifically focus on strength and power development.[24,25] These findings appear to highlight the importance of more sport-specific training, as further development of these attributes may influence the players' peak running speed[25] and, in turn, match running performances.

Consistent with elite male AF research,[26] the positional activity profiles of female AF match-play varied considerably. Midfielders covered greater total, relative, low-, moderate-, and high-speed distances than both half-line and full-line players. Furthermore, activity profiles were greater for half-line players than full-line players. High-speed running distances were similar across the three positions in the selected group. Conversely, non-selected midfielders covered more high-speed running distance than other non-selected players. In agreement with previous research,[12] the distances covered at high-speed were closely related to performance on the Yo-Yo test. The selected midfielders covered greater total distances than non-selected players as a direct result of greater playing time. Although there were no differences in overall work rate between groups, it is likely that the superior Yo-Yo IR1 scores allowed selected players to remain on-field for extended periods of time while still matching the intensity of non-selected players. However, to increase work rate, coaching staff should seek to rotate selected players more regularly to better utilise these higher-skilled players throughout the match.

Finally, although total relative distances reported in this study are comparable with elite junior AF competition (range: 45-126 $m.min^{-1}$ and 68-134 $m.min^{-1}$ for females and elite junior males,[27]respectively), male footballers cover up to 70% greater high-speed distances than female players (range: 4-30 $m.min^{-1}$ and 13-45 $m.min^{-1}$ for female and elite junior males,[27]respectively). To aid in the advancement of female AF, players should be exposed to greater amounts of high-intensity running in training.

Conclusion

This is the first study to investigate the influence of physical qualities on team selection and activity profiles in female AF match-play. The findings demonstrated that players who are faster and have greater intermittent running ability are more likely to be selected to a State Academy program and that midfielders perform more activity during match-play than half-line and full-line players. These results provide important information that can be used to establish appropriate preseason training programs to maximise the preparedness of the entire playing group competing in the National Women's AF competition. Future research should

extend upon these findings by investigating differences in the activity and skill profiles of players competing in the National competition and by recruiting players from a wider range of female football academies.

Practical Applications

The assessment of speed and high intensity running ability is vital for female AF players as these qualities can influence both team selection and activity profiles. The reported average match intensities should be used as a starting point for training programs; however preseason training should aim to expose these players to increasing intensities. Specifically, coaching and conditioning staff may choose to incorporate high-intensity work rates of elite junior male AF competition and use those intensities as benchmarks for future training. Physical fitness should be assessed early in the preseason to identify deficiencies and facilitate targeted approaches for improvement.

Despite the novelty of the reported findings, the relatively small sample size and the restriction of player recruitment from only one Australian State competition are both limitations that should be taken into consideration when interpreting the results. Additionally, extra individual training sessions were not accounted for and if performed, these would likely influence the physical qualities of individual players. Nevertheless, it is important to emphasise that there is a paucity of research evaluating the game and positional demands of female AF players competing at different levels. Given the National Women's AF competition will be introduced in 2017, the results presented in this study have the potential to make a significant contribution to this area of research, despite these potential shortcomings.

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Table 1. Physical qualities of selected and non-selected female Australian Football players.

	Selected	Non-selected	Difference	p-value	ES ± 90% CI
Physical Characteristics					
Age (yr)	23.2 ± 4.5	23.4 ± 4.9	-0.20	0.759	0.10 ± 1.64
Height (cm)	167.2 ± 5.0	167.9 ± 5.0	-0.40	0.746	0.07 ± 0.22
Body mass (kg)	67.8 ± 8.1	65.4 ± 9.0	2.40	0.330	0.20 ± 0.35
Playing experience (years)	4.0 ± 2.8	2.1 ± 1.6	1.9	0.022*	0.78 ± 0.55
Performance					
Lower body power (watts.kg^{-1})	44.0 ± 7.1	41.6 ± 6.2	2.34	0.164	0.35 ± 0.51
5-metre sprint time (s)	1.19 ± 0.15	1.20 ± 1.26	-0.01	0.559	0.09 ± 3.14
30-metre sprint time (s)	4.85 ± 0.31	5.06 ± 0.32	0.21	0.044*	0.57 ± 0.47
20-30-metre velocity (m.sec^{-1}) [a]	7.17 ± 0.51	6.81 ± 0.49	0.36	0.032*	0.65 ± 0.46
Yo-Yo IR1 distance (m) [a]	712 ± 251	495 ± 252	216.5	<0.001*	1.09 ± 0.46

*denotes significant difference between groups

[a] denotes inclusion in discriminant analysis

Table 2. Match activity profiles of selected and non-selected female AF players

	Selected	Non-selected	Difference (%)	p-value	ES ± 90% CI
Midfielders					
Field Time (minutes)	74.9 ± 5.7	69.1 ± 12.1	7.8	0.004*	0.85 ± 0.56
Total Distance (metres)	8018.1 ± 832.3	7532.3 ± 1240.1	6.1	0.009*	0.73 ± 0.52
Relative Distance (m.min^{-1})	107.9 ± 9.6	108.9 ± 9.3	-0.9	0.950	0.07 ± 0.44
Low-speed Distance (m.min^{-1})	58.5 ± 4.8	57.6 ± 3.5	0.1	0.867	0.19 ± 0.38
Moderate-speed Distance (m.min^{-1})	35.5 ± 8.7	36.5 ± 9.4	-0.2	0.769	0.04 ± 0.46
High Speed Distance (m.min^{-1})	13.9 ± 5.2	14.8 ± 4.8	-0.7	0.948	0.06 ± 0.42
Half Back/Forward Line					
Field Time (minutes)	77.4 ± 4.3	75 ± 6 [m]	3.1	0.558	0.54 ± 0.43
Total Distance (metres)	7249.7 ± 1085.1 [m]	6792.3 ± 1353.7	6.3	0.695	0.25 ± 0.44
Relative Distance (m.min^{-1})	92.7 ± 11.9 [m]	90.9 ± 15.5 [m]	2.2	0.252	0.09 ± 0.44
Low-speed Distance (m.min^{-1})	55.0 ± 4.6 [m]	54.7 ± 7.8	1.8	0.767	0.15 ± 0.45
Moderate-speed Distance (m.min^{-1})	25.0 ± 7.0 [m]	24.9 ± 7.9 [m]	4.0	0.452	0.22 ± 0.44
High Speed Distance (m.min^{-1})	12.7 ± 5.3	11.3 ± 4.6 [m]	8.3	0.954	0.31 ± 0.43
Full Back/Forward Line					
Field Time (minutes)	69.8 ± 6.4	68.0 ± 15 [h]	2.5	0.135	0.27 ± 0.53
Total Distance (metres)	5484.6 ± 1017.7 [m h]	4909.8 ± 1523.5 [m h]	10.4	0.256	0.56 ± 0.75
Relative Distance (m.min^{-1})	78.2 ± 15.9 [m h]	72.7 ± 17.8 [m h]	7.6	0.827	0.34 ± 0.90
Low-speed Distance (m.min^{-1})	46.3 ± 8.7 [m h]	46.2 ± 9.5 [m h]	0.0	0.636	0.39 ± 0.96
Moderate-speed Distance (m.min^{-1})	20.8 ± 6.3 [m]	18.7 ± 7.2 [m h]	10.0	0.862	0.18 ± 0.84
High Speed Distance (m.min^{-1})	12.8 ± 3.6	7.8 ± 4.5 [m h]	41.7	0.851	0.30 ± 0.93

*denotes significant difference between groups

[m] denotes difference from midfielders at a significance level of <0.05

[h] denotes difference from half-line players at a significance level of <0.05

Table 3. Relationships between physical qualities and running performance variables (controlling for position) in female Australian football players, with 90% Confidence Intervals *[Lower limit, Upper limit]*.

	RelDist	LowSpDist	ModSpDist	HighSpDis
Lower Body Power	0.362	-0.107	0.389	0.393
	[-0.273, 0.584]	*[-0.468, 0.128]*	*[-0.306, 0.331]*	*[-0.182, 0.599]*
5-m Time	0.161	-0.263	0.124	-0.612†
	[-0.167, 0.384]	*[-0.467, 0.136]*	*[-0.220, 0.574]*	*[0.228, 0.735]*
20 to 30-m Velocity	0.474	-0.156	0.379	0.775*
	[-0.032, 0.586]	*[-0.514, 0.186]*	*[-0.220, 0.574]*	*[0.496, 0.863]*
30-m Time	-0.496†	0.182	-0.415	-0.807*
	[-0.570, 0.065]	*[-0.218, 0.537]*	*[-0.540, 0.274]*	*[-0.848, -0.487]*
Yo-Yo IR1T	0.194	-0.106	0.096	0.489†
	[-0.215, 0.317]	*[-0.390, 0.233]*	*[-0.388, 0.259]*	*[0.154, 0.690]*

Δ RelDist= relative distance; LowSpDist = relative low-speed distance; ModSpDist = relative moderate-speed distance; HighSpDist = relative high-speed distance.

* denotes significance at $p < 0.01$.

†denotes significance at $p < 0.05$.