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A skill profile of the national women's Australian football league (AFLW).

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Abstract

Objectives: To investigate the relationship between technical involvements and (1) winning margins, (2) losing margins and (3) ladder position in the national Australian Football League Women's competition (AFLW).

Methods: The first season of AFLW technical data were analysed. All matches (n = 26) were separated into winning and losing subsets and score margins were recorded. To investigate the influence of technical involvements on overall performance, final ladder position was also recorded.

Results: Uncontested possessions and the ratio between the number of times the ball was inside the attacking 50-m zone (inside 50s) and goals scored, were identified as the biggest predictors of match outcomes in the AFLW. Larger winning margins were associated with reduced marks "inside 50" and a lower inside 50: goals scored ratio. Kicks and contested marks demonstrated significant relationships with final ladder position, with these involvements decreasing as the ladder position moved closer to eight.

Conclusions: Team game plans should promote the importance of finding space and completing a number of passes in the attacking 50-m zone to allow closer shots on goal. Further to this, coaches may need to draft players who are able to "win" marking contests to improve ladder position in the future seasons.

Keywords: technical involvements, team sports, match result, ladder position

Introduction

Women's Australian football has grown exponentially during the last 5 years, culminating with the inaugural season of the Australian Football League Women's (AFLW) competition being played in 2017. Australian football (AF) is a high-intensity intermittent, invasion contact game with the objective of advancing the ball down the field using either foot (kicking) or hand (handball) skills with the final aim of kicking the ball between upright posts at the opposing end of the field (Robertson et al. 2016). An AF match consists of two teams competing over four 20-min ball-in-play quarters; typically, teams consist of 22 players, with 18 players on the field at any one time and 4 interchange players. However, the AFLW competition modified the traditional rules to facilitate a free-flowing style of football. During the AFLW season, teams comprised 22 players, with 16 (2 wingers removed) on-field players (6 interchange). Games consisted of 15-min quarters with time on for goals and injuries that interrupted play. Additional time excluded periods when the ball went out of bounds. The rule modifications, in combination with other factors such as player fitness and coaching styles, may explain differences in running intensities between sub-elite (78-107 $m.min^{-1}$) and elite (102-128 $m.min^{-1}$) female AF match-play (Clarke et al. 2018; Black et al. 2018). With the recent development of women's football at both the state and national level, and within the context of differences in game rules at the top level of the game, skill profiling in female football warrants greater investigation.

Influences on match results on running demands in AF have been investigated (Sullivan et al. 2014; Ryan et al. 2017). Greater relative total distances (metres per minute) were associated with matches won in elite male AF players (Ryan et al. 2017). In contrast, high-speed running was greater during matches lost than won (Sullivan et al. 2014; Ryan et al. 2017). High-speed running is suggested to be greater during losses as teams spend a lower percentage of time in possession (Gronow et al. 2014) and hence perform more high-speed efforts in chasing and attempts to regain possession of the ball (Ryan et al. 2017). On the contrary, early evidence from sub-elite female players has suggested activity profiles have little effect on match outcome (Black et al. 2019). Running-based match performance is often reported as the distances covered over the course of a game. However, performance is arguably more

dependent on the skill efficiency of a team. Skill involvement has influenced game outcome in elite male AF players, with winning teams completing a greater number of disposals, kicks and marks than losing teams (Sullivan et al. 2014). More recently, researchers identified that the number of kicks and goal accuracy were the most influential technical predictors of success in male AF matches (Robertson et al. 2016). While recent research has highlighted the average skill profile of elite female AF (Clarke et al. 2018), these data are only representative of one competitive team and did not account for the influence of match outcome on overall skill demands. As technical skill profiles of a number of team sports have demonstrated significant contributions to performance (Rampinini et al. 2009; Sullivan et al. 2014; Robertson et al. 2016), it is likely that skill involvements influence match outcome in women's AF. With this in mind, the aim of this research was to investigate the relationship between team performance indicators, match outcomes and team success in the AFLW.

Methodology

Technical Information

This study used a retrospective, observational design in which average team technical data were obtained from the 2017 AFLW (teams n = 8; total matches n = 28) season. Two games were removed from the analysis as they resulted in a drawn match. The skill involvements reported in this study are described in Table 1 and are commonly reported performance indicators in AF (Robertson et al. 2016). All match statistics were freely accessible on the official AFL website (AFL.com, Victoria, Australia). Data from this provider have shown acceptable reliability for reporting skill profiles in AF (O'Shaughnessy 2006). To allow comparisons between male AF match-play, ball-in-play time was manually recorded from women's match broadcast video footage. To assess intra-rater reliability of the ball-in-play time, two AFLW matches were analysed on two separate occasions, 2 weeks apart. The Cronbach's alpha test for internal consistency was used to assess reliability of the ball-in-play time. The Cronbach's alpha (α) result for internal consistency reliability was 0.95 for intra-rater reliability.

This study also compared multiple skills to create two derived performance indicators (Robertson et al. 2016); goal accuracy and inside 50s: goals scored (Table 1) . Goals and behinds (points) were removed from the analyses, as they were not deemed technical skills, rather match-specific outcomes. All matches were divided into two subsets (win/loss) based on the match outcome. The score margin was also recorded at the end of each match. For the final component of the study, data were sorted into final ladder position (eight levels). A ladder position closer to one was indicative of a higher ranked team, while a position closer to eight was indicative of a lower ladder position.

Insert Table 1 here

Statistical Analyses

Descriptive statistics (mean ± SD) for all technical involvements were obtained for the 2017 AFLW season. A one-way ANOVA was also used to determine difference between winning and losing teams for each of the performance indicators for match outcome. A chi-squared automatic interaction detection (CHAID) classification tree was used to model the relationship between skill involvements and match outcomes. The CHAID classification tree estimated a regressive relationship between variables and a binary outcome (win/loss). A minimum of five cases were required to create a "child" node. Furthermore, the partitioning ceased when the null hypothesis could not be rejected ($P > 0.05$) (Woods et al. 2017). Classification trees model non-linear phenomena, and also provide visual data easily interpreted by non-analysts (Morgan et al. 2013; Robertson et al. 2015, 2016). Ordinal binary logistic regressions were used to examine the relationship between skill involvements and (1) winning score margins, (2) losing score margins and (3) final ladder position. Prior to the regression analysis, multicollinearity was assessed using the variance inflation factor (VIF > 10) (Field 2013). Handballs, contested possessions and uncontested possessions were subsequently removed from the regression analysis due to displaying VIF greater than 10.

Results

Significantly greater kicks (P = 0.008), marks (P = 0.025), uncontested possessions, (P = 0.022), disposal efficiency (P = 0.002), and a superior inside 50: goals scored ratio (P = 0.002) were found for winning teams compared to losing AFLW teams. The inside 50: goals scored ratio and uncontested possessions were the only variables included in the CHAID model (Figure 1), explaining 88.5% of match outcomes. The model successfully classified 20 of the 26 recorded wins (76.9%) and 26 of the 26 losses (100%).

Insert Figure 1 here

Table 2 demonstrates the ordinal logistic regression for the relationship between score margin and skill involvements during wins and losses. A negative relationship was reported between larger winning margins and marks "inside 50" (P = 0.040) and inside 50: goals scored ratio (P = 0.007). As losing margins increased "inside 50s" decreased (P = 0.019). Although not statistically significant a positive relationship was observed between tackles and losing margin (P = 0.059) while a negative relationship was recorded between disposal efficiency and losing margin (P = 0.089), as increased margins resulted in lower disposal efficiency.

Insert Table 2 here

Table 3 demonstrates the results of the ordinal logistic regression between ladder position and skill involvements. A significant relationship was reported between ladder position and kicks (P = 0.034) and contested marks (P = 0.04), with the number decreasing as the ladder position moved away from one. No other skill involvements significantly explained final ladder position.

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148 *Insert Table 3 here*

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Discussion

This study is the first to explore the skill profile of female AF match-play, and to investigate which, if any, skill involvements influenced match outcome. Here, winning teams performed with greater disposal efficiency and had more kicks, marks, and uncontested possessions than the losing teams. Furthermore, winning teams also converted more "inside 50s" into goals than losing teams. However, the CHAID model demonstrated the ratio between 'inside 50′ entries and goals scored and uncontested possessions were the only significant predictors of match outcome, predicting 88.5% of match outcomes in the first AFLW season. No other differences were reported between wins and losses, suggesting that other factors, such as physical fitness (Mooney et al. 2011) and physical activity profiles (Hulin and Gabbett 2015) may also influence match success in female footballers. Given the number of similarities in skill profiles in winning and losing teams, developing the skills and game-play of female footballers should serve to further delineate winning teams from losing teams in the AFLW competition.

The inaugural season of the AFLW demonstrated that women's football follows a more congested match style, with an average stoppage occurring every 60 s of match-play, compared with 1 every 78 s (Champion Data ©) in men's AFL. Data obtained from freely available sources (www.afl.com.au) demonstrated female teams were involved in a greater number of contested possessions (2.1 ± 0.4 for females vs. 1.8 ± 0.2 for males), tackles (1.3 ± 0.3 for females vs. 0.9 ± 0.2 for males) and clangers (0.8 ± 0.4 for females vs. 0.6 ± 0.1 for males) per minute of match-play than male teams. Male AF teams complete a greater number of handballs, uncontested possessions, contested marks and reported a higher disposal efficiency than female teams. It important to note that over the past 30 years, male AFL players have become full-time athletes, which has subsequently resulted in greater levels of physical conditioning, aerobic fitness, skill ability and well-practiced coordinated attacking and defensive strategies (Norton et al. 1999). Irrespective of differences across competitions, this early research should highlight the importance of gender specificity when developing training and game strategies for female AF.

In agreement with previous elite male AF research (Sullivan et al. 2014), winning AFLW teams performed more kicks and reported a greater disposal efficiency than their losing counterparts. Winning teams also completed more marks than the losing teams, suggesting that winning teams are able to maintain possession for longer periods of time, which has been associated with winning quarters in AF (Gronow et al. 2014). Interestingly, handballs, contested possessions, clangers, and the number of "inside 50s" were consistent across games irrespective of match outcome in female teams. On the contrary, generally an "inside 50" entry is likely to result in a scoring opportunity in male AF matches (Woods et al. 2016). It is possible female AF teams are more likely to lose possession of the football "inside 50" as they have to complete a greater number of disposals to allow a closer shot on goal. Nonetheless, it is well acknowledged that males demonstrate a greater kicking velocity compared with female athletes (Barfield et al., 2002) which subsequently results in a greater kicking distance. Therefore, it is important to investigate the distances from goal from such entries that have the greatest association with goals scored in female AF. Furthermore, ball delivery into the attacking 50 m zones ("inside 50") should be analysed to promote other ball entry options, as opposed to (the traditional) kicking long to a congested centroid. These results highlight that factors other than skill ability may be more predictive of match outcome in this league. Notwithstanding, the only predictors of match outcome in female AF were uncontested possessions and the ratio between "inside 50s" and goals scored. Given there were no differences in marks taken "inside 50" between winning and losing teams, it may be that goals are more likely to be scored from ball contests close to goal or from uncontested run-on plays following a kick to space. Future research should aim to investigate the passages of play that lead to goals scored in female AF matches. When analysed according to the magnitude of match outcome margins, large winning margins were associated with less marks "inside 50" and lower inside 50: goals scored ratio. The lower number of marks "inside 50" suggest that as winning margins increase, teams may be able to find more space and run the ball "inside 50" as opposed to kicking long to marking contests. Larger losing margins were associated with less "inside 50s" and demonstrated trends of reduced disposal efficiency and increased tackles. As research has shown tackles negatively influence

disposal efficiency during offside touch (Johnston et al. 2016), it is possible the increase in tackles result in elevated fatigue (Johnston et al. 2016) and a reduced disposal efficiency during female AF matches. As early evidence concerning the running demands of female AF shows little difference between the winning and losing teams (Black et al. 2019), our findings suggest that total skill involvements may influence game outcome to a greater extent than running-based activity profiles. However, further research is required to understand the complex relationship between activity profiles and skill involvements in female AF.

Interestingly, kicks and contested marks were the only technical involvements that displayed a relationship with ladder position. In AF a mark constitutes a "free-kick", therefore a greater number of contested marks suggests higher ranked teams may spend a greater amount of time in possession with the football (Gronow et al. 2014). Furthermore, contested possessions have previously been associated with subsequent draft success in junior male AF (Woods et al. 2016). Similarly, AFLW coaches may need to recruit players who have the ability to "win" marking contests. Irrespective of these findings, the absence of any other significant relationships between technical involvements and final ladder position may be explained by the short competitive season, with each team playing a total of seven matches. It is likely coaching strategy, player fitness and opposition strategy were developed and manipulated throughout the season. As success in AF is multifactorial, future research is warranted to explore the differences in skill ability, physical fitness and running performances between high and low-quality teams in order to advance the AFLW competition.

While the findings reported in this study are novel, the small sample size (one season) should be considered when interpreting the results as teams only competed against each other on one occasion. Future research should expand data collection to include multiple seasons to confidently establish key metrics that contribute to success in the AFLW. Finally, given the complex relationship between technical and running demands in team sports, future research should aim to incorporate both skill and

running-based activity profile data into predictive models to understand which, if any, running variables contribute synergistically or independently to match success.

Practical applications

The novelty of the reported findings provides early evidence to suggest the ratio between inside 50s and the number of goals scored and uncontested possessions are the greatest predictors of match success in female AF. As “inside 50s”are not associated with match success in the female competition, coaches should assess their game plans, perhaps aiming for a number of passes “inside 50” to allow closer shots on goal. Furthermore, as uncontested possessions were associated with match success, evasive and reactive agility drills that promote “finding space” and quick ball movement should be programmed into training. Additionally, coaches may need to draft players who are able to “win” contested marks to improve ladder position in future competitive seasons.

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References

Barfield WR, Kirkendall DT, Yu B. 2002. Kinematic instep kicking differences between elite female and male soccer layers. J Sci Sport Med. 1(3):72-79.

Black GM, Gabbett TJ, Naughton G, Cole MH, Johnston RD, Dawson B. 2018. The influence of physical qualities on activity profiles of female Australian football match-play. Inter J Sports Physiol Perform. 13(4):524-529.

Black GM, Gabbett TJ, Naughton G, Cole MH, Johnston RD, Dawson B. 2019. The influence of contextual factors on running performance in female Australian football match-play. J Strength Cond Res. 33(9):2488-2495.

Clarke AC, Ryan S, Couvalias G, Dascombe BJ, Coutts AJ, Kempton T. 2018. Physical demands and technical performance in Australian Football League Women's (AFLW) competition match-play. J Sci Med Sport. 21(7):748-752.

Field A. 2013. Discovering statistics using IBM SPSS statistics. Sussex (United Kingdom): Sage.

Gronow D, Dawson B, Heasman J, Rogalski B, Peeling P. 2014. Team movement patterns with and without ball possession in Australian football league players. Inter J Perform Anal Sport. 14(3):635-651.

Hulin BT, Gabbett TJ. 2015. Activity profiles of successful and less successful semi-elite rugby league teams. Inter J Sports Med. 36(6):485-489.

Johnston RD, Gabbett TJ, Jenkins DG, Speranza MJ. 2016. Effect of different repeated-high-intensity-effort bouts on subsequent running, skill performance, and neuromuscular function. Inter J Sports Physiol Perform. 11:311-318.

Mooney M, O'Brien B, Cormack S, Coutts A, Berry J, Young W. 2011. The relationship between physical capacity and match performance in elite Australian football: a mediation approach. J Sci Med Sport. 14(5):447-452.

Morgan S, Williams MD, Barnes C. 2013. Applying decision tree induction for identification of important attributes in one-versus-one player interactions: a hockey exemplar. J Sports Sci. 31(10):1031-1037.

Norton KI, Craig NP, Olds TS. 1999. The evolution of Australian football. J Sci Med Sport. 2(4):389-404.

O'Shaughnessy DM. 2006. Possession versus position: strategic evaluation in AFL. J Sports Sci Med. 5(4):533-540.

Rampinini E, Impellizzeri F, Castagna C, Coutts AJ, Wisløff U. 2009. Technical performance during soccer matches of the Italian Serie A league: Effect of fatigue and competitive level. J Sci Med Sport. 12(1):227-233.

Robertson D, Back N, Bartlett JD. 2016. Explaining match outcome in elite Australian rules football using team performance indicators. J Sports Sci. 34(7):637-644.

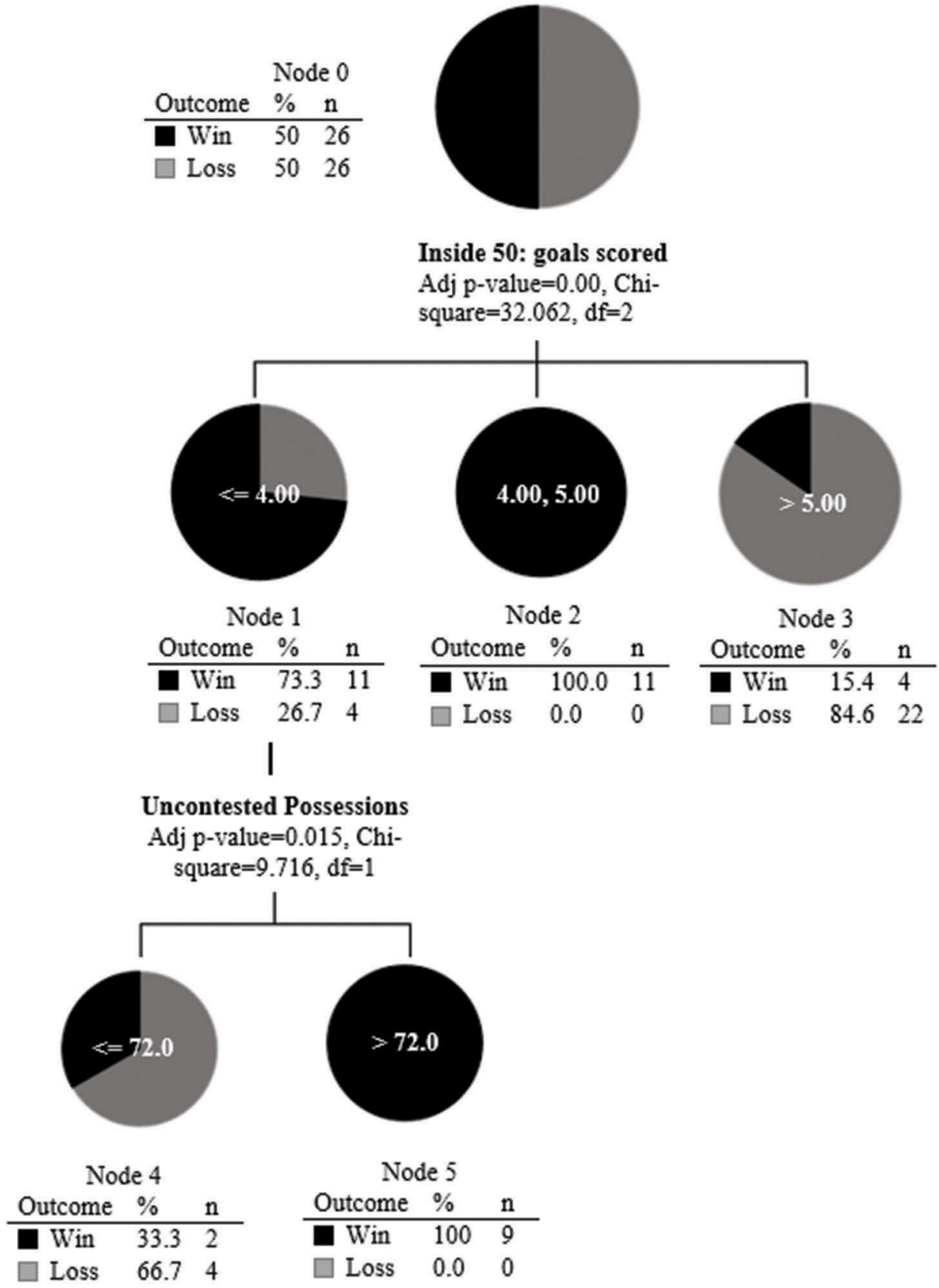
Robertson S, Woods C, Gastin P. 2015. Predicting higher selection in elite junior Australian rules football: the influence of physical performance and anthropometric attributes. J Sci Med Sport. 18(5):601-606.

Ryan S, Coutts AJ, Hocking J, Kempton T. 2017. Factors affecting match running performance in professional Australian football. Int J Sports Physiol Perform. 12(9):1199-1204

Sullivan C, Bilsborough JC, Cianciosi M, Hocking J, Cordy J, Coutts AJ. 2014. Match score affects activity profile and skill performance in professional Australian football players. J Sci Med Sport. 17(3):326-331.

Woods CT, Joyce C, Robertson S. 2016. What are talent scouts actually identifying? Investigating the physical and technical skill match activity profiles of drafted and non-drafted U18 Australian footballers. J Sci Med Sport. 19(5):419-423.

Woods CT, Sinclair J, Robertson S. 2017. Explaining match outcome and ladder position in the national rugby league using team performance indicators. J Sci Med Sport. 20(12):1107-1111.



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295 **Figure 1**. CHAID classification tree model results explaining match outcome in the AFLW

296 **Table 1.** Description of technical skills of AF assessed in this study

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Technical skill	Description
Kick	Disposing of the ball with any part of the leg below the knee including kicks off the ground
Handball	Disposing of the ball by striking it with a fist while it rests on the opposing hand
Disposals	Summation of kicks and handballs
Disposal Efficiency (%)	The percentage of disposals that hit intended target or are placed to the advantage of team mates
Contested possession	Possessions obtained while in congested, and physically pressured situations
Uncontested possession	Possessions obtained while a player is under no physical pressure from the opposition
Mark	When a player catches a kicked ball that has travelled more than 15 m without it having touched the ground or another player
Contested mark	A mark achieved while engaging in a contest
Clanger	A disposal which goes directly to an opposition player; a conceded free kick; dropped mark or fumble under no pressure
Tackle	Using physical contact to prevent an opposition player in possession of the ball from getting an effective disposal
Inside 50	An action of moving the ball from the midfield into the forward 50 m zone
Goal accuracy (%)	The percentage of shots on goal compared to goals scored, expressed as a percentage
Inside 50:goals scored	The number of inside 50's relative to the number of goals scored expressed as a ratio

Table 2: Ordinal logistic regression results demonstrating the relationship between score margin and skill involvements

Technical Involvement	Estimate	SE	LCI	UCI	p-value
Win					
Marks	−0.140	0.078	−0.257	0.050	0.185
Tackles	0.020	0.046	−0.070	0.110	0.657
Contested marks	0.163	0.155	−0.140	0.467	0.292
Marks Inside 50	−0.139	0.068	−0.272	−0.006	0.040*
Inside 50	0.162	0.089	−0.013	0.337	0.070
Inside 50:goals scored	−0.388	0.144	−0.671	−0.150	0.007*
Disposal efficiency	−0.008	0.097	−0.198	0.182	0.935
Kicks	0.036	0.047	−0.056	0.129	0.441
Loss					
Marks	0.109	0.073	−0.034	0.252	0.134
Tackles	0.080	0.042	−0.003	0.163	0.059
Contested marks	−0.030	0.223	−0.466	0.406	0.893
Marks Inside 50	−0.088	0.059	−0.203	0.028	0.137
Inside 50	−0.211	0.090	−0.388	−0.034	0.019*
Inside 50:goals scored	0.073	0.053	−0.031	0.177	0.171
Disposal efficiency	−0.140	0.082	−0.302	0.021	0.089
Kicks	−0.060	0.040	−0.138	0.017	0.127

Estimate denotes the beta coefficient estimate; SE denotes the standard error of the coefficient; LCI denotes the lower 95% confidence interval of the estimate; UCI denotes the upper 95% confidence interval of the estimate. * denotes significance ($P < 0.05$)

Table 3: Ordinal logistic regression results demonstrating the relationship between ladder position and skill involvements

Technical Involvement	Estimate	SE	LCI	UCI	p-value
Marks	0.790	0.051	−0.021	0.178	0.120
Tackles	0.008	0.028	−0.047	0.063	0.766
Contested marks	−0.259	0.126	−0.506	−0.012	0.040*
Marks Inside 50	0.059	0.039	−0.018	0.136	0.131
Inside 50	−0.096	0.055	−0.203	0.012	0.082
Inside 50:goals scored	0.011	0.043	−0.073	0.095	0.795
Disposal efficiency	−0.004	0.058	−0.118	0.109	0.939
Kicks	−0.064	0.030	−0.123	−0.005	0.034*

Estimate denotes the beta coefficient estimate; SE denotes the standard error of the coefficient; LCI denotes the lower 95% confidence interval of the estimate; UCI denotes the upper 95% confidence interval of the estimate. * denotes significance ($P < 0.05$)