The use of player physical and technical skill match activity profiles to predict position in the Australian Football League draft

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Abstract

This study investigated the extent to which position in the Australian Football League (AFL) national draft is associated with individual game performance metrics. Physical / technical skill performance metrics were collated from all participants in the 2014 national under 18 (U18) championships (18 games) drafted into the AFL (n = 65; 17.8 ± 0.5 y); 232 observations. Players were subdivided into draft position (ranked one to 65) and then draft round (one to four). Here, earlier draft selection (i.e., closer to one) reflects a more desirable player. Microtechnology and a commercial provider facilitated the quantification of individual game performance metrics (n = 16). Linear mixed models were fitted to data, modelling the extent to which draft position was associated with these metrics. Draft position in the first / second round was negatively associated with "contested possessions" and "contested marks", respectively. Physical performance metrics were positively associated with draft position in these rounds. Correlations weakened for the third / fourth rounds. Contested possessions / marks were associated with an earlier draft selection. Physical performance metrics were associated with a later draft selection. Recruiters change the type of U18 player they draft as the selection pool reduces. Juniors with contested skill appear prioritised.

Key words: Talent selection; Predictive modelling; Notational analytics; Performance analysis; Recruiting

Introduction

The Australian Football League (AFL), similar to other elite team sporting organisations around the world, hosts an annual draft. The main focus of the draft is to provide AFL teams with the opportunity to select players (predominately 18 years of age; the age a player is first draft eligible) whom they believe may contribute to their team's immediate and long-term performance. The draft also acts as one of several equalisation strategies implemented by the AFL to promote fairness and competitiveness across all 18 teams. Other equalisation measures include a stringent player salary cap, and a recently implemented measure to control off-field football department spending (e.g. football department wages).

This talent selection process (defined as choosing the most appropriate individual or group of individuals to perform a specific task) (Vaeyens, Lenoir, Williams, & Philippaerts, 2008; Williams & Reilly, 2000) is critical for AFL teams to maintain and improve their competitive advantage over other clubs. Although each organisation is eligible to recruit talent within the draft, the order of their selection is largely based on their ladder position at the conclusion of the previous AFL season. More directly, AFL teams ranked lower on the ladder at the conclusion of the previous season (i.e., poorer performing teams) are given draft picks early in the selection sequence, and superior performing clubs receive selections later in the sequence. This selection sequence process is designed to provide relatively poorer performing teams with the opportunity to build a more competitive playing roster. Thus, players selected earlier in the draft sequence (i.e., a lower selection number) may be more sought after by an AFL team. Specifically, they could be expected to possess more desirable performance characteristics relative to their counterparts drafted later in the sequence (i.e., a higher selection number). However, these desirable performance characteristics are yet to be objectively elucidated within the literature.

This draft selection sequencing generates an environment where teams must strategize in order to optimise their capped number of selections. Hence, teams often look to acquire meaningful, objective performance data on each draft nominated player to help inform and/or confirm potential selections. To partially facilitate this process, the AFL has established an elite Under 18 (U18)

national championship competition. First commencing in 1995, this event consists of talent identified (defined through selection onto a State Academy program) U18 players representing their state in a four-to-six week tournament. These matches provide AFL recruiters the opportunity to observe the best available junior talent and apply their subjective expertise in the hope of identifying suitable draft choices (Burgess, Naughton, & Norton, 2012).

The continued development of sport-oriented performance analysis microtechnology, such as global positioning systems (GPS), has provided an additional source of information for AFL recruiters; objectively complementing their subjective perceptions generated through game-play observation. Specifically, GPS technology has facilitated in-depth analyses into the physical match activity profiles of Australian football (AF) players (Brewer, Dawson, Heasman, Stewart, & Cormack. 2010; Coutts, Quin, Hocking, Castagna, & Rampinini, 2009; Wisbey, Montgomery, Pyne, & Rattray, 2010). Given the intermittent and prolonged physical nature of AF game-play, the more common physical performance metrics (indicators of physical actions) derived from the use of GPS technology include total or absolute distance (metre; m), relative distance (metre per minute; $m.min^{-1}$), and high intensity running distance (metres covered >15 $km.hr^{-1}$) (Burgess et al., 2012; Jennings, Cormack, Coutts, Boyd, & Aughey, 2010). This performance analysis microtechnology is currently used within the national U18 championships.

Given the multi-dimensional qualities required by AF players, physical performance reflects only one element of effective play (Woods, Raynor, Bruce, McDonald, & Collier, 2015). For instance, players must possess proficient technical skill qualities that broadly encapsulate different aspects of ball disposal (e.g. kicking and/or handballing under certain environmental contexts) (Tangalos, Robertson, Spittle, & Gastin, 2015; Robertson, Back, & Bartlett, 2015). Thus, to provide AFL recruiters with the objective data to complement their subjective perceptions of a players technical skill, a commercial statistical provider; namely Champion Data© (Champion Data©, Melbourne, Australia), conducts notational analyses on the technical skill involvements of players within the national U18 championships. Given the broad types of technical skill involvements players encounter during game-play (Tangalos et al., 2015), these notations are generally inclusive of the total number

of ball disposal involvements (total possessions), contested possessions (total possessions obtained when pressured from opponents), inside 50's (attacking passage of play), and clearances (total possessions obtained clearing the ball from a contest).

Woods, Joyce and Robertson (2015) recently demonstrated that players drafted into the AFL accrued a greater count of technical skill involvements (defined by a greater number of inside 50's and contested possessions) in comparison to their non-drafted counterparts. Similarly, Burgess, Naughton and Hopkins (2012) observed an interaction between physical and technical performance qualities and draft selection (selected, non-selected) in U18 AF players. However, although insightful, these studies did not investigate the extent to which physical and/or technical skill performance metrics quantified during game-play were associated with draft position (i.e., the gradient of player skill level within the pool of drafted players). This warrants further research, as identifying match activity profiles that may lead to a higher draft position could hold important implications for training interventions in youth AF competitions, as well as the talent selection strategies utilised by AFL recruiters to optimise their draft picks. We hypothesise that superior technical skill and physical performances in game-play will be meaningfully associated with higher draft position, as such players are likely to provide immediate and long-term benefits to an AFL club. This investigation aims to determine the extent to which draft position is associated with a player's physical and/or technical skill match activity profile.

Methodology

In-game physical and technical skill performance metrics were collated for all participants in the 2014 national U18 championships that were subsequently drafted into the AFL at the conclusion of the 2014 season (n = 65; 17.8 ± 0.5 y) within the national draft. These drafted players were selected from a total sample of 244 players playing within the U18 national championships. These data originated from all 18 championship games; resulting in a total of 232 player observations. Players were subdivided into draft position based upon selection number (ranked one to 65) and round (ranked one to seven); with this information being retrieved from a commercially accessible website (http://www.afl.com.au/draft/draft-tracker). Of these 232 observations, 76 were contributed from draft

round one, 67 from draft round two, 50 from draft round three, 26 from draft round four, 5 from draft round five, 4 from draft round six, and 4 from draft round seven. The uneven observational spread was due to the continual reduction in the potential talent selection pool, and was thus inevitable. Ethical approval was obtained from the relevant Human Research Ethics Committee.

As a part of participation in the 2014 national U18 championships, each player was required to wear a portable GPS unit (Catapult Innovations, Team Sport 5.0, Firmware 6.54, 10 Hz, Melbourne, Australia) located between the scapulae and embedded within a pouch in their uniform. Although players originated from different State Academy programs, the GPS units and corresponding firmware were the same, and where possible, players wore the same GPS unit during each game. These data were downloaded after each game by the State Academy support staff using the propriety analysis software (Catapult Sprint Version 5.0.92, Melbourne, Australia) and exported to Excel as a .csv file (Microsoft, Redmond, USA) for analysis. Only active playing time was analysed, and as such, quarter breaks and interchange periods for each player were omitted prior to analysis. The same physical performance metrics described by Woods et al. (2015) were used to quantify the player's physical match activity profile, and were inclusive of absolute distance (m); relative distance ($m.min^{-1}$); high speed running distance ($m >15\ km.hr^{-1}$), and high speed running distance expressed as a percentage of absolute distance ($\%total >15\ km.hr^{-1}$). These have been shown to be the most clinimetrically robust when compared to other GPS-derived metrics (Jennings et al., 2010).

A similar selection of technical skill performance metrics as described by Woods et al. (2015) were supplied form a commercial notational provider (Champion Data©, Melbourne, Australia). The data supplied by this provider to the AFL Talent Pathway is part of a broader commercial agreement with the AFL. These notations and their corresponding descriptions are presented in Table I. The notational analysis conducted by this provider is considered clinimetrically acceptable (O'Shaughnessy, 2006). The data were then entered into a custom designed Excel spreadsheet (Microsoft, Redmond, USA) for analysis.

******INSERT TABLE I ABOUT HERE******

142 Descriptive statistics (mean ± standard deviation) for each physical and technical skill
143 performance metric were calculated for each drafted round. We first modelled the relationship
144 between draft round and player physical and technical skill performances. To do this, we built a set of
145 sixteen single-term models with each performance metric coded as a predictor variable and draft
146 round was the response variable. Cumulative logistic mixed models were used for this part of the
147 analyses and were implemented using the 'ordinal' package within the *R* computing environment
148 (version 3.1.3 *R* Core Team, 2014). Cumulative logistic mixed models are a form of ordered
149 regression models and are used when the response data are categorical and have some type of order or
150 sequence. This modelling framework extends the typical ordinal regression model to include random
151 effects, and in our case, this allows us to model the data with respect to repeated measurements on the
152 same subjects (players) through time (games). The data were centred and scaled before analysis and
153 sub-setted to include only the first four rounds of the draft, due to low numbers of observations in
154 rounds five to seven. 'Player' was included as a random effects term in all models and the Adaptive
155 Gauss-Hermite Quadrature (nAGQ) value was set to 10. The confidence intervals of the model
156 parameter estimates were calculated using the *confint* function, with '*P*-values' estimated using
157 Wald's method.

158 We also modelled the relationship between a players physical and technical skill
159 performances and the position *within* the first draft round. We built a set of sixteen single-term models
160 using a performance metric as the response variable and first round draft position as the predictor
161 variable. Linear missed modelling was used for this part of the analysis. The models were fitted to the
162 data using the *lme4* package (Bates, Maechler, Bolker et al., 2014), also within *R* (*R* Core Team,
163 2014). These data were centred and scaled prior to analysis to assist model convergence (Bates et al.,
164 2014). Performance metric was the response variable and draft position was the fixed effect for each
165 model built. 'Player' was included as a random effect, taking into account the repeated measurements
166 with subjects. A Gaussian distribution was assumed for the error. All data were visualised using
167 *ggplot2* (Wickham, 2009).

Finally, we modelled the relationship between a player's position *within a draft round* and their physical and technical skill performances. Again, a set of sixteen single-term models were built for each draft round using the same response and predictor variables as described previously. These linear mixed models were fitted to the draft round data using the same package and statistical computing environment as defined in the previous paragraph, and produced a set of 64 models. The data were again centred and scaled prior to analysis to assist with model convergence (Bates et al., 2014). In these models, performance metric was coded as the response variable, and draft position was the fixed effect. A Gaussian distribution was again assumed for the error.

Results

The descriptive statistics for each physical and technical skill performance metric across draft rounds one to four is displayed in Table II. None of the physical or technical skill performance metrics were able to meaningfully predict the round in which a player was drafted (one to four) (Figure I). However, within the first draft round, a significant negative correlation was noted between contested possessions and draft position (Table III); with a players performance in this metric decreasing as draft selection in the first round increased. Conversely, a significant positive correlation between relative distance, high speed running distance, and high speed running percentage was noted in the first draft round (Table III).

******INSERT FIGURE I ABOUT HERE******

******INSERT TABLE II ABOUT HERE******

******INSERT TABLE III ABOUT HERE******

Ten of the 64 models fit to the performance metric data by round estimated significant ($P < 0.05$) positive or negative slopes that were greater than zero (Figure II). Seven of the slope estimates were positive and three were negative. Nine of the ten significant slope estimates were from draft rounds one ($n = 4$) and two ($n = 5$). Within draft round one, relative distance, high speed running distance, and high speed running percentage were positively correlated with draft position, and the number of contested possessions was negatively correlated with draft position. Within draft round

two, the weak positive correlations of relative distance (β (SE) = 0.076 (0.035); 95% CI = 0.007 – 0.145), high speed running distance (β (SE) = 0.060 (0.025); 95% CI = 0.011 – 0.109), and high speed running percentage (β (SE) = 0.077 (0.030); 95% CI = 0.018 – 0.136) remained, while the number of contested marks was negatively correlated with draft position (β (SE) = -0.069 (0.020); 95% CI = -0.109 – -0.030). Within draft round three, absolute distance was the only significant correlation; being negatively correlated with draft position (β (SE) = -0.085 (0.027); 95% CI = -0.139 – -0.033).

******INSERT FIGURE I ABOUT HERE******

Discussion

This study investigated the extent to which position in the AFL national draft was associated with an U18 player's physical and/or technical skill match activity profile. It was hypothesised that superior match activity profiles would correlate with lower draft position given the immediate and long-term success such players would be expected to provide an AFL team. Results indicated that none of the physical or technical performance metrics were predictive of draft round (one to four). However, within the first draft round, three physical metrics demonstrated a weak positive correlation with draft position, and one technical metric demonstrated a weak negative correlation with draft position. Specifically, relative distance, high speed running distance, and high speed running percentage were all positively correlated with the position a player was drafted in the first round, whilst contested possessions was negatively correlated with draft position in this round. This indicates that players drafted earlier in the first round have a greater capability of accruing contested possessions, while players drafted later in this round exhibit relatively superior running qualities during game-play. These physical observations remained relatively constant for draft position in the second round, however in this instance, contested marks was negatively correlated with draft position rather than contested possessions. This indicates that AFL recruiters favour a player's capacity to record contested marks more so in the second round in comparison to other technical skill and physical performance metrics. Although speculative, it is possible that a player's field position influenced this observation. Thus, future research may wish to investigate the influence of playing position on draft success and position. Nonetheless, this study presents insightful data that details the complex

interaction between a player's game-based performance in the national U18 championships and their subsequent draft position in the AFL.

When the results of this study are coupled with the findings of Woods et al. (2015) it can be concluded that contested elements of AF game-play (namely contested possessions and contested marks) are considerably influential for determining both an U18 players draft outcome (e.g. drafted or non-drafted), and draft position (selection in the first or second round; early or late). It could be postulated that juniors who can obtain or retain ball possession in temporally and/or spatially constrained contexts would be of value to AFL teams given the invasive and collisional nature of game-play (Gray & Jenkins, 2010); particularly within the AFL (Burgess et al., 2012). This observation has considerable implications for the training of prospective juniors. Specifically, junior coaches aiming to improve the likelihood of their players being drafted into the AFL should implement training drills that promote a high level of contested game-play; such as small-sided games (Farrow, Pyne, & Gabbett, 2008). Such drills may facilitate the development of contested skill, and in doing so, improve the likelihood of an optimistic draft outcome.

Of note were the significant positive correlations for the physical performance metrics and draft position in both the first and second round. This indicates that players drafted later in these rounds were likely to be more proficient runners during game-play than those drafted earlier within the same round. Consequently, AFL recruiters appear to change the 'type' of player they draft as the talent selection pool is reduced each round. This indicates that the more successful teams who possess the later draft picks may have players currently on their roster who already possess effective contested skills, and thus do not actively seek to draft such juniors as vigorously as the lower performing teams with the earlier draft picks. Conversely, AFL teams may look to draft more technically skilled players earlier in the draft sequence; reducing the number of players with such skills as the draft sequence increases.

Traditionally, AFL clubs will draft the best available player with their first pick, the next best available with their second pick, and so on. Given this process facilitates the continual size reduction

of the potential talent selection pool; some AFL recruiters may decide to strategically use their later picks to draft slightly ambiguous players. More directly, clubs may seek to draft juniors in later rounds who possess one or two considerably impressive performance qualities, but perhaps lack performance capabilities in other 'traditional' indicators. This is partially supported by our results, given the inability of the physical and technical skill performance metrics to meaningfully associate with draft positon in rounds three and four. Consequently, it would be of value for future research to progress the analyses described here by including additional metrics, such as tactical performance. The inclusion of such may improve the depth of understanding with regards to the association between talent selection and individual game performance; providing a more comprehensive insight into the qualities that may/may not assist with a juniors AFL draft prospects.

Conclusion

Contested possessions and contested marks are the two performance metrics most associated with an earlier draft position in rounds one and two, respectively. Physical performance metrics appear to be more associated with a later draft position in these rounds; suggesting that as the talent selection pool grows smaller, AFL recruiters change the type of player they select within the national draft. The association between these performance metrics and draft position seems to weaken in draft round three and four; indicating that AFL clubs select players later in the national draft using performance indictors that were not investigated here. It is important to note that this study was only conducted on one draft cohort (the 2014 draft), and as such, future research should look to analyse multiple cohorts. This may account for factors such as playing position and/or environmental conditions, which may influence the physical and/or technical skill involvements players' generate during game-play. Nonetheless, the current study provides a strong basis to guide both talent selection strategies in the AFL, and interventions aimed at improving a juniors AFL draft prospects. Additionally, the statistical analyses conducted in this study may be of use for other sports where a drafting system is used.

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322 **Table I.** The technical skill performance metrics and corresponding description used within this study

Technical performance metrics	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
Effective disposals	Disposals resulting in a positive outcome for the team in possession (i.e. correctly passed to a teammate)
Contested possessions	Possessions obtained while in congested, and physically pressured situations (i.e. obtaining possessions of the ball while in dispute)
Uncontested possessions	Possessions obtained while a player is under no immediate physical pressure from the opposition
Mark	When a player cleanly catches (deemed by the umpire) a kicked ball that has travelled more than 15 metres without anyone else touching it or the ball hitting the ground
Contested mark	A mark recorded while engaging in a congested, physically pressured situation
Uncontested mark	A mark recorded while under no physical pressure
Inside 50	An action of moving the ball from the midfield into the forward 50 m zone
Tackle	Using physical contact to prevent an opposition in possession of the ball from getting an effective disposal
Clearance	Disposing of the ball from a congested stoppage in play

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Table II. Descriptive statistics (mean ± standard deviation) for each physical and technical skill performance metric according to draft round (one to four)

Performance metric	Round one	Round two	Round three	Round four
Total distance (m)	9639.5 ± 1437.0	9909.1 ± 1778.7	10138.7 ± 1866.2	9785.1 ± 1608.8
Relative distance ($m.min^{-1}$)	121.5 ± 13.5	121.8 ± 17.6	135.3 ± 14.2	119.6 ± 16.6
High speed (%)	25.9 ± 4.3	27.5 ± 5.4	31.2 ± 6.2	27.8 ± 6.1
High speed (m >15$km.hr^{-1}$)	2521.9 ± 668.2	2741.2 ± 748.2	3204.7 ± 961.3	2736.8 ± 6.1
Kicks	9.5 ± 4.3	8.6 ± 3.9	8.0 ± 3.9	7.5 ± 3.5
Handballs	5.8 ± 3.3	6.2 ± 3.4	5.2 ± 2.9	5.0 ± 1.9
Disposals	15.4 ± 6.2	14.8 ± 5.5	13.3 ± 5.4	12.5 ± 4.7
Effective disposals	10.9 ± 4.7	10.7 ± 4.6	9.3 ± 4.6	8.8 ± 3.5
Contested possessions	6.6 ± 2.9	5.9 ± 3.1	5.4 ± 2.5	5.2 ± 2.1
Uncontested possessions	8.7 ± 5.2	8.8 ± 3.8	7.8 ± 4.1	7.5 ± 3.8
Marks	3.7 ± 2.1	3.0 ± 2.2	2.9 ± 1.8	3.2 ± 2.2
Contested marks	0.6 ± 0.9	0.4 ± 0.6	0.1 ± 0.4	0.3 ± 0.5
Uncontested marks	3.3 ± 2.0	2.6 ± 2.0	2.7 ± 1.7	2.8 ± 2.2
Tackles	2.6 ± 1.8	2.5 ± 2.0	3.8 ± 2.5	3.0 ± 2.4
Clearances	1.7 ± 1.8	1.7 ± 2.1	1.6 ± 1.7	1.0 ± 1.4
Inside 50 m	3.1 ± 1.8	1.9 ± 1.5	2.3 ± 1.7	1.8 ± 1.6

Table III. Model parameter estimates of the linear mixed effects models fitted to the first round draft position data

Performance metric	Estimate	SE	LCI	UCI
Total distance (m)	0.020	0.018	-0.016	0.056
Relative distance ($m.min^{-1}$)*	0.059	0.026	0.007	0.113
High speed (%)*	0.054	0.022	0.012	0.097
High speed (m >15$km.hr^{-1}$)*	0.041	0.019	0.004	0.080
Kicks	-0.011	0.034	-0.077	0.056
Handballs	0.005	0.030	-0.053	0.065
Disposals	<0.001	0.037	-0.072	0.075
Effective disposals	0.008	0.034	-0.057	0.076
Contested possessions*	-0.061	0.021	-0.102	-0.017
Uncontested possessions	0.036	0.039	-0.039	0.115
Marks	0.002	0.021	-0.040	0.044
Contested marks	-0.027	0.033	-0.094	0.038
Uncontested marks	0.013	0.022	-0.030	0.057
Tackles	0.010	0.023	-0.035	0.057
Clearances	-0.029	0.034	-0.095	0.039
Inside 50 m	-0.027	0.026	-0.078	0.025

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

Figure I. The centred and scaled data used for the ordinal regression models demonstrating that none of the physical and technical skill performance metrics are discriminative of draft round.

Figure II. The linear model lattice fitted by round and performance metric

Note: The interpretation of this Figure is as follows: Filled circles are positive correlations; the empty circles are negative correlations; black circles represent 'non-significant' (P >0.05) effects; orange circles represent 'significant' (P <0.05) effects.

uncont., uncontested; cont., contested; eff., efficiency; HS, high speed