Journal of Science and Medicine in Sport xxx (2014) xxx–xxx

Contents lists available at ScienceDirect

Journal of Science and Medicine in Sport

journal homepage: www.elsevier.com/locate/jsams

Original research

Predicting higher selection in elite junior Australian Rules football: The influence of physical performance and anthropometric attributes

Sam Robertson [a,*], Carl Woods [b], Paul Gastin [a]

[a] Centre for Exercise and Sports Science, School of Exercise and Nutrition Sciences, Deakin University, Australia
[b] School of Exercise and Health Sciences, Edith Cowan University, Australia

ARTICLE INFO

Article history:
Received 8 March 2014
Received in revised form 20 July 2014
Accepted 31 July 2014
Available online xxx

Keywords:
Prediction
Logistic regression
Talent identification
Rule induction
Relative age effect

ABSTRACT

Objectives: To develop a physiological performance and anthropometric attribute model to predict Australian Football League draft selection.
Design: Cross-sectional observational.
Methods: Data was obtained ($n = 4902$) from three Under-18 Australian football competitions between 2010 and 2013. Players were allocated into one of the three groups, based on their highest level of selection in their final year of junior football (Australian Football League Drafted, $n = 292$; National Championship, $n = 293$; State-level club, $n = 4317$). Physiological performance (vertical jumps, agility, speed and running endurance) and anthropometric (body mass and height) data were obtained. Hedge's effect sizes were calculated to assess the influence of selection-level and competition on these physical attributes, with logistic regression models constructed to discriminate Australian Football League Drafted and National Championship players. Rule induction analysis was undertaken to determine a set of rules for discriminating selection-level.
Results: Effect size comparisons revealed a range of small to moderate differences between State-level club players and both other groups for all attributes, with trivial to small differences between Australian Football League Drafted and National Championship players noted. Logistic regression models showed multistage fitness test, height and 20 m sprint time as the most important attributes in predicting Draft success. Rule induction analysis showed that players displaying multistage fitness test scores of >14.01 and/or 20 m sprint times of <2.99 s were most likely to be recruited.
Conclusions: High levels of performance in aerobic and/or speed tests increase the likelihood of elite junior Australian football players being recruited to the highest level of the sport.

1. Introduction

The recruitment and selection of athletes in team sports is an important consideration from both a performance and financial perspective. As many professional sports implement both draft systems and salary caps in order to maintain equity across competition,[1] such decisions should be well-informed by obtaining relevant athlete information prior to selection. In Australian football (AF), a component of this information may relate to athlete physiological and anthropometric attributes, which are commonly tested at both the elite[2–4] and sub-elite junior level.[5,6] Whilst the relative importance of such factors can vary depending on the physical requirements of a sport,[7,8] there is considerable evidence supporting their contribution to player selection and performance in AF.[9–11] For example, in junior levels of AF, running endurance, speed and lower limb power have all been shown to discriminate both selected and higher performing players.[6,11] The effects of these attributes on selection are also evident at the elite level of the sport, with previous work showing both linear acceleration and lower body power as discriminative of selection within an Australian Football League (AFL) team.[4] Despite this, it is not clear as to whether players displaying well-developed ability in a single attribute are less likely to be selected than those performing well in several, or whether multiple physical profiles (as opposed to a single profile) may be predictive of higher selection. Of further relevance is the potential influence of the relative age effect (RAE), a phenomenon which relates to a selection bias towards those players born earlier in the year.[12] The RAE has been previously shown to exist previously in AF-based research, with birthdate distributions having been compared to both football participant[13] and general populations.[12]

* Corresponding author.
E-mail address: sam.robertson@deakin.edu.au (S. Robertson).

http://dx.doi.org/10.1016/j.jsams.2014.07.019
1440-2440/

The AFL Under-18 National Championships represent the highest level of competition possible for elite junior AF players and are held annually between eight teams, each representing an Australian state or territory. Two divisions of four teams each play five games in this competition; with the first tier including the traditional AF states of South Australia, Western Australia and Victoria (two teams; Victoria Metropolitan and Victoria Country). Each state selects squads of up to 50 players each year to participate in these games, with those selected being chosen from clubs within relevant state-based competitions. These series of games also provide an opportunity for AFL team scouts and recruiters to observe and assess players and obtain information to supplement physical testing data.[14] This is in addition to the ongoing observation that occurs by AFL recruiting staff throughout the regular state-based competitions. Nonetheless, it is unknown if physiological performance and anthropometric attributes discriminate players participating in the National Championships and those who also achieve higher selection (i.e., being drafted to the AFL). Specifically, predictive models that can identify optimal physiological and anthropometric profile/s for players seeking higher selection are not currently available.

The aim of this study was to assess the discriminative ability of physiological and/or anthropometric attributes across three junior AF selection-levels (1: players drafted into the AFL; 2: National Championship representatives; 3: State-level representatives). We hypothesised that multiple performance attribute profiles exist in predicting player selection to a higher level.

2. Methods

Physiological performance and anthropometric testing data were obtained from three AF state-based competitions over four years (January 2010 to January 2013). Birthdates for all players were also acquired. All invited players completed the same physical performance testing battery set by the relevant governing body. These organisations were the TAC Cup (Victoria), South Australian National Football League (SANFL; South Australia) and the Western Australian Football League (WAFL; Western Australia). Although minor differences may have existed in assessment conditions at these sessions (e.g. temperature or time of day), all testing was undertaken in indoor stadiums on hardwood floors. Access and consent to non-identifiable testing data was provided by each of the relevant state-based organisations and the study was approved by the relevant human research ethics advisory group.

Following a standardised warm up consisting of light jogging, countermovement jumps and dynamic stretching, all players had information collected relating to their standing height (cm), body mass (kg), standing vertical jump (cm), running vertical jump – left and right leg (cm), 20 m sprint (s) (with time splits also recorded for 5 m and 10 m), AFL agility test (s) and the 20 m multistage fitness test (20 m MSFT). For the vertical jumps, the sprint and the agility tests, players were provided with three trials, with their best recorded for use in the analysis. Specific details relating to the protocols followed for each of the abovementioned tests are standardised across AFL state organisations and can be found in other research undertaken in junior AF.[6,15] In all three competitions, testing was undertaken in groups of eight to ten players, with randomised ordering used for all tests with the exception of the 20 m MSFT which was completed last by all players. Where players were tested in consecutive years (i.e., in their first and second year of playing at their specific club), only data from their final year of testing was utilised. This was done to ensure uniformity across player comparisons as well as to allow for considerations relating to biological maturity, which has been shown to influence running performance at different stages of adolescence.[5]

For analysis purposes, players were allocated to one of the three groups (selection-level) based upon their highest level of representation within their final year of junior AF (Under-18). These groups were defined as the following: (1) 'AFL Drafted' – player selected in either AFL National Draft or AFL Rookie Draft; (2) 'National Championship' – player selected as a State squad member in the AFL Under-18 Championships or (3) 'State-level' – player selected as squad member for TAC Cup, SANFL Colts or WAFL Colts club.

Prior to main analyses being undertaken, an inter-item correlation matrix was constructed to investigate relationships between the tested attributes. Due to strong correlations being noted between both 5 m and 10 m sprint times with 20 m sprint times ($r = 0.857$ and 0.853, respectively), only the latter was used in further analyses. Descriptive data for selection-level (3 levels: AFL Drafted, National Championships and State-level), competition (3 levels: South Australia, Western Australia and Victoria) and year (4 levels: 2010, 2011, 2012 and 2013) (n, mean, standard deviation (SD), 95% confidence intervals (CI), missing values) were obtained for remaining physiological and anthropometrical attributes. Hedge's effect sizes[16] were obtained as a standardised measure of the effect of these factors on each physiological and anthropometric attribute, whilst allowing for differences in group sizes. The magnitude of the effect sizes was interpreted using a scale outlined by Hopkins[17] where values <0.2 are deemed trivial, 0.2–0.6 small, 0.6–1.2 moderate, 1.2–2.0 large and 2.0–4.0 very large. To assess the dataset for the RAE, separate chi-squared analyses were undertaken comparing birthdate distributions between the three selection levels for each yearly quartile (Q1: Jan–Mar; Q2: Apr–Jun; Q3: Jul–Sep; and Q4: Oct–Dec) and half-year period (H1: Jan–Jun; and H2 Jul–Dec).

To assess the effect of selection-level on the physiological and anthropometrical attributes, two types of models were constructed. Prior to this, any player not possessing a full testing profile (i.e., reported a value for each attribute) was excluded. First, binary logistic regression models were constructed, where '1' indicated an AFL Drafted player and '0' indicated a National Championships player. Second, the *JRip* algorithm[18,19] was used to develop a set of propositional rules to best discriminate player selection-level, with the model fit defined by the number of instances classified and misclassified by these rules. The minimum total weight of the instances in a rule was set to 1.0 with fourfolds used for pruning the model. The rule induction analysis was undertaken using the R-Weka interface[20] whereas all other statistical analyses were performed using SPSS V20 (Armonk, NY: IBM Corp).

3. Results

Descriptive data (Table 1) relating to each physiological and anthropometric attribute were obtained from a total of 4892 players, of which 292 were AFL Drafted, 293 were National Championship representatives and 4317 State-level representatives.

Hedge's effect sizes showed generally trivial to small[21] (range = 0.05–0.40) differences between AFL Drafted and National Championship players, with generally greater (small to moderate) differences noted between these two groups and the State-level players (range = 0.47–0.71 and 0.25–0.57, respectively). Comparisons of player performance for year (supplementary file) revealed only trivial differences across the attributes. Results relating to between-competition comparisons for AFL Drafted and National Championship players are presented in Table 2.

A total of 1056 players were removed due to incomplete athletic profiles; leaving a total 3846 in the sample. Of these, 1344 were from Western Australia (AFL Drafted, $n = 51$; National Championship, $n = 52$ and State-level, $n = 1241$), 1201 were from Victoria (AFL Drafted, $n = 117$; National Championship, $n = 76$; State-level,

Please cite this article in press as: Robertson S, et al. Predicting higher selection in elite junior Australian Rules football: The influence of physical performance and anthropometric attributes. *J Sci Med Sport* (2014), http://dx.doi.org/10.1016/j.jsams.2014.07.019