Journal of Science and Medicine in Sport 18 (2015) 225–229

Contents lists available at ScienceDirect

Journal of Science and Medicine in Sport

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

Original research

Predicting playing status in junior Australian Football using physical and anthropometric parameters

Carl T.E. Woods [a,*], Annette J. Raynor [a,c], Lyndell Bruce [b], Zane McDonald [b], Neil Collier [b]

[a] School of Exercise and Health Sciences, Edith Cowan University, Australia
[b] School of Medical Sciences, Royal Melbourne Institute of Technology University, Australia
[c] School of Health Sciences, University of South Australia, Australia

ARTICLE INFO

Article history:
Received 16 August 2013
Received in revised form 23 October 2013
Accepted 5 February 2014
Available online 12 February 2014

Keywords:
Talent identification
Predictive modelling
Draft Combine
Team sports

ABSTRACT

Objectives: To use physical and anthropometric parameters to predict playing status in junior Australian Football.
Design: Cross-sectional observational.
Methods: Participants were recruited from the under 18 competition within the West Australian Football League and classified into two groups; elite (state representative; $n = 50$; 17.9 ± 0.5 y; 184.8 ± 6.9 cm; 80.6 ± 9.4 kg) and sub-elite (non-state representative; $n = 50$; 17.8 ± 0.6 y; 179.8 ± 5.4 cm; 74.4 ± 7.9 kg). Both groups completed physical/anthropometric tests inclusive of a 5 m, 10 m and 20 m sprint, an agility test, stationary vertical jump, dynamic dominant and non-dominant foot vertical jump, 20 m multistage fitness test, standing height and body mass. A multivariate analysis of variance was used to test the main effect of 'status' on the physical/anthropometric parameters, whilst logistic regression models were used to predict playing status using the physical/anthropometric parameters.
Results: On average, the elite group were taller, heavier, had a greater stationary vertical jump, dynamic dominant and non-dominant foot vertical jump and higher maximal aerobic capacity as measured by the multistage fitness test ($p < 0.05$). The combination of standing height, dynamic vertical jump non-dominant foot and the 20 m multistage fitness test were the strongest predictors of status (Akaike's Information Criterion = 96.35).
Conclusions: Despite mean differences in a number of parameters, the combination of standing height, dynamic vertical jump non-dominant foot and the multistage fitness test were the strongest predictors of status and thus important tests for initially identifying potential talent in junior Australian Football.

1. Introduction

Current talent identification (TID) practices within elite multi-faceted team sports inclusive of the Australian Football League (AFL), the National Football League (NFL) and the National Basketball Association (NBA), are often a combination of subjective assessments made by recruitment or talent scouts, and objective assessments stemming from a draft combine.[1] Within the AFL, the annual draft combine is spread over a four day period, during which elite junior players (typically under 18 y of age) participate in a battery of tests designed to assess their potential playing ability, ensuring their suitability for selection by an AFL team.

Whilst being a common practice for identifying talent within single discipline sports,[2,3] predictive modelling seems to be scarcely used within multi-faceted team sports[1]; perhaps due to the complexity of the games' skill requirements. For example, a skilful performance within team sports is often a combination of physical, technical and tactical components,[4] however some of these attributes (such as decision making ability) are more difficult to quantify. Thus, physical and/or anthropometric assessments may provide a means for initially identifying juniors who possess the potential for success. For example, Keogh[5] successfully discriminated selection within an elite junior Australian Football (AF) team based upon fitness and anthropometric tests, whilst within the NFL, physical parameters have been used to successfully predict draft outcome (drafted vs. non-drafted).[6,7]

Despite the aforementioned studies, research is yet to identify the particular physical and/or anthropometric parameter(s) that best predict status within junior AF and are therefore important for initial TID practices. Thus, the aims of this study were twofold; firstly, to identify the physical and anthropometric characteristic(s) that differed according to status (elite/sub-elite) within junior AF;

* Corresponding author.
E-mail addresses: c.woods@ecu.edu.au, ctwoods@our.ecu.edu.au (C.T.E. Woods).

http://dx.doi.org/10.1016/j.jsams.2014.02.006

and secondly, to develop a predictive model that identified the physical and anthropometric parameter(s) that best predicts status in junior AF, highlighting their importance for initial TID practices in junior AF.

2. Methodology

From a total sample of 316 under 18 (U/18) West Australian Football League (WAFL) players with an age range of 17.9 ± 0.6 y, two groups; namely, elite (n = 50; 17.9 ± 0.5 y) and sub-elite (n = 50; 17.8 ± 0.6 y) were selected. The elite sample consisted of 50 players who had been selected in the 2013 WAFL State U/18 Academy squad, whilst the sub-elite sample consisted of 50 players randomly chosen from the remaining cohort of 266 WAFL U/18 players not selected in the Academy squad using the random number generation package in Excel (Microsoft, Inc.). At the time of recruitment all players were injury free and participating in regular training sessions. The relevant Human Research Ethics Committee provided ethical approval with all players and parents/guardians (if under 18 y of age) providing written informed consent prior to testing.

Players completed a battery of eight tests similar to those used within the AFL Draft Combine, namely a 20 m sprint test, the AFL agility test, a stationary vertical jump (SVJ) test, a dynamic vertical jump dominant (DVJD) foot test, a dynamic vertical jump non-dominant (DVJND) foot test, the 20 m multistage fitness test, standing height and body mass. All testing was completed on wooden flooring with the exception of the 20 m sprint and the AFL agility test which were completed on a synthetic running track. Testing took place at the end of the 2013 preseason to ensure peak physiological fitness. A maximum of 50 players were tested at a time, with standing height and body mass being the first measurements recorded. Prior to the physical tests, a standardised warm up was completed by all players, consisting of light jogging, unilateral and bilateral countermovement jumps and dynamic stretches. The physical tests were completed in a circuit fashion and in the following order: 20 m sprint; AFL agility test; SVJ test; DVJD foot test; DVJND foot test. Players were randomly sub-divided into five groups of approximately 10 and each group was assigned to one of the five testing stations. The 20 m multistage fitness test was undertaken after all other testing was completed, with players being split into two equal groups to complete the test. For tests consisting of multiple trials, 1 min was allocated between each trial, whilst 2 min was allocated between each testing station. Verbal encouragement was provided for each test requiring maximal effort.

Standing height: A stadiometer (Hart Sport, Queensland, Australia) was used to obtain standing height, with measurements being recorded to the nearest 0.1 cm. Players were required to remove their footwear and were placed in the Frankfort Plane, and instructed to inhale as the measurement was taken.

Body mass: A set of calibrated digital scales (A&D Company Limited, Tokyo, Japan) were used to obtain body mass. Players were required to remove their footwear; with body mass being recorded to the nearest 0.1 kg. Training shorts and a singlet were permitted.

Stationary and dynamic vertical jump: The stationary and dynamic jump heights were obtained using a Vertec jump device (Swift Performance Equipment, Lismore, Australia). A stationary bilateral countermovement jump was used to obtain the players SVJ height, with the dynamic vertical jump being performed off the outside foot following a 5 m straight line run-up. This was completed for both a dominant and non-dominant foot take-off, with foot dominance being defined as the player's preferred kicking foot. At the highest point of each jump, the inside hand was used to displace the vanes of the Vertec, with the highest vane displaced being recorded. The jump height for both the stationary and dynamic jump was recorded as the difference between the standing reach height (obtained prior to completing both jumps) and the highest vane displaced whilst jumping. For each jump (stationary/dynamic), three trials were completed by all players, and the maximum jump height (cm) obtained was used as the criterion value for analysis.

5 m, 10 m and 20 m sprint: The 5 m and 10 m sprint times were obtained as splits from a 20 m sprint. Timing lights (Swift Performance Equipment, Lismore, Australia) were used to measure sprint times, with gates being placed at the start line, 5 m, 10 m and 20 m distances and 1.5 m wide. Players commenced the sprint in a stationary up-right position, placing their lead foot on the start line. They were cued "*do not decelerate until you reach the two cones*", which were placed four metres past the 20 m finish line to ensure they did not decelerate. The players commenced the sprint when ready, thus eliminating a reaction time. Times were recorded to the nearest 0.01 s, with the fastest 5 m, 10 m and 20 m time of three trials being used as the criterion values for analysis.

AFL agility test: The same AFL agility test as described by Young and Pryor[8] was used, with this test requiring the players to manoeuvre as quickly as possible around five 1.1 m high poles; each with a circumference of 12 cm. If a pole was displaced during the test, the trial was abandoned and re-started after 1 min. Players were instructed to not touch the ground with their hands when changing direction with the trial being abandoned if this occurred. Timing lights (Swift Performance Equipment, Lismore, Australia) were placed 1.5 m apart and were positioned at the start and end of the test. The fastest time of three trials was used as the criterion value for analysis, with times being recorded to the nearest 0.01 s.

Maximal aerobic capacity: The 20 m multistage fitness test was used to estimate the players maximal aerobic capacity, with the test protocols outlined by Ellis and colleagues.[9] Specifically, players were required to continually run back and forth along a 20 m distance, whilst keeping in time with a 'beep' emitted by a compact disc. The time between each beep (shuttle) gradually decreased as the test (or levels) progressed; requiring the players to incrementally increase their running speed. The test was concluded when the player either (1) reached volitational exhaustion or (2) was unable to keep time with the beeps on two consecutive occasions. The highest level and shuttle successfully obtained by each player was used as the criterion value.

Mean and standard deviation were calculated for each physical and anthropometric parameter. A multivariate analysis of variance (MANOVA) was used to test the main effect of 'status' (2 levels: elite, sub-elite) on the physical and anthropometric parameters. This analysis simultaneously tested the effect of status across all of the criterion variables while controlling for inflated Type-I error rates. The effect size (ES) of status on the physical and anthropometric parameters was calculated using Cohen's d statistic. An effect size of $d = 0.20$ was considered small, $d = 0.50$ moderate and $d > 0.80$ large.[10] All between group mean comparisons were done using the SPSS software (Version 19, SPSS Inc., USA). The Type-I rate was set at $p < 0.05$.

Logistic regression models were used to predict status using the physical and anthropometric parameters as explanatory variables, with status coded as a binary variable (1 = elite, 0 = sub-elite). The logistic regression modelling and visualisation were done using the R statistical computing software version 2.15.1 (R, Development Core Team, 2012). The parameters that significantly differed according to status were then used as the predictor variables, and were included in the full model. Following this, the most parsimonious model was found by reducing the full model using the 'stepAIC' function in the *MASS* package.[11] This function returns the best model using forward and backward model selection based on Akaike's Information Criterion (AIC).[12,13]

Additionally, the *pROC* package[14] was used to run a sensitivity analysis on the strongest combination model, and for separate models containing only single term predictors, to assess the ability