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A Cripps

The University of Notre Dame Australia, ashley.cripps@nd.edu.au

C Joyce

The University of Notre Dame Australia, chris.joyce@nd.edu.au

C Woods

L Hopper

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1 Biological maturity and the anthropometric, physical and technical assessment of talent identified U16
2 Australian footballers

3 Ashley J Cripps¹, Christopher Joyce¹, Carl T Woods², Luke S Hopper³

4 ¹ School of Exercise and Health Sciences, University of Notre Dame Australia, Fremantle, Australia

5 ² Discipline of Sport and Exercise Science, James Cook University, Townsville, Queensland, Australia

6 ³ Western Australian Academy of performing Arts, Edith Cowan University, Perth, Australia

7 **Corresponding author:**

8 Ashley J Cripps, School of Exercise and Health Sciences, University of Notre Dame Australia,
9 Fremantle, Australia.

10 Email: ashley.cripps@nd.edu.au

11

12 **Abstract**

13 This study compared biological maturation, anthropometric, physical and technical skill measures
14 between talent and non-talent identified junior Australian footballers. Players were recruited from the
15 under 16 Western Australian Football League and classified as talent (state representation; n = 25, 15.7
16 ± 0.3 y) or non-talent identified (non-state representation; n=25, 15.6 ± 0.4 y). Players completed a
17 battery of anthropometric, physical and technical skill assessments. Maturity was estimated using years
18 from peak height velocity calculations. Binary logistic regression was used to identify the variables
19 demonstrating the strongest association with the main effect of ‘status’. A receiver operating
20 characteristic curve was used to assess the level of discrimination provided by the strongest model.
21 Talent identified under 16 players were biologically older, had greater stationary and dynamic leaps
22 and superior handball skill when compared to their non-talent identified counterparts. The strongest
23 model of status included standing height, non-dominant dynamic vertical jump and handball outcomes
24 (AUC = 83.4%, CI = 72.1%-95.1%). Biological maturation influences anthropometric and physical
25 capacities that are advantageous for performance in Australian football, talent identification methods

26 should factor biological maturation as a confound in the search for junior players who are most likely
27 to succeed in senior competition.

28 **Keywords:**

29 Talent identification, adolescent, development, team sport

30

31 **Introduction**

32 The assessment of anthropometric and physical capacities for talent identification in team sports
33 is common as successful team sport players require a range of well-developed physical attributes [1, 2].
34 Considerable research has explored the link between physical testing performance and talent
35 identification in Australian football at an under 18 (U18) level [3-5]. However, Australian football
36 research has highlighted that only 47.5% of athletes selected into elite U18 squads had previously been
37 selected into elite under 16 (U16) squads, highlighting issues with the talent identification process at
38 the U16 level [6]. Recent research in adolescent team sports demonstrates that differences in maturity
39 are likely to contribute to anthropometric and physical performance variation [7, 8] and coaches
40 perceptions of player skill and potential [9, 10], which in turn are likely to impact on talent identification
41 outcomes. Effects of maturational differences on performance outcomes are strongest in younger
42 players around the time of peak height velocity [11]. However, there is a lack of research examining
43 factors which explain the talent identification of young (< 17 years) Australian footballers. Educating
44 coaches as to the potential influence of biological maturation on physical performance outcome
45 assessments may assist with the reduction of talent misclassification. Specifically, this education
46 process may make coaches cognisant of avoiding acute selection bias associated with superior physical
47 and/anthropometric measures underpinned by biological maturation.

48 The Australian Football League Talent Pathway (AFL TP) is the primary developmental
49 pathway for talent identified junior Australian footballers seeking to compete in elite senior competitions
50 (i.e., within the AFL) [6]. The AFL TP is designed to accelerate the development of talented juniors to
51 ensure the sustained supply of senior talent to the AFL. The AFL TP provides talent identified player's

52 access to experienced coaches, advanced training resources, support staff and participation in elite
53 junior competitions. The AFL TP has three selection stages which are associated with; U16 and U18
54 state representative teams, and into the professional AFL teams. Recent research exploring the
55 effectiveness of the AFL TP reported that only 27.7% of drafted players had previously been selected
56 onto elite U16 teams [6]. Further, only 47.5% of athletes selected at the U16 level were retained onto
57 U18 squads. Poor retention of juniors may be linked to the relative age effect repeatedly reported in
58 adolescent competitions [6, 12, 13], which suggests that older players are looked upon more favourably
59 in the initial identification process due to maturational advantage. This suggestion is supported by recent
60 findings that Australian football coaches' perceive earlier maturing individuals to possess advanced
61 technical skills and greater long-term potential [9, 10]. However, despite these findings there is no
62 available research exploring factors which drive identification into the AFL TP at the U16 level. It may
63 be postulated that earlier maturing athletes at the U16 level could experience identification advantage
64 as they have been shown to possess both superior physical attributes and be perceived by coaches' to
65 have greater long-term potential [9, 10]. Whilst later maturing players may fail to be identified due to
66 acute performance disadvantages associated with being less mature. Such identification outcomes may
67 negatively affect pathway efficiency as physical performance advantages and disadvantages associated
68 with maturity reduce with age, which may result in later maturing players catching up and replacing
69 those initially talent identified at the U16 level.

70 The poor retention of players initially identified onto the AFL TP may represent an inefficient
71 use of pathway resources and may reduce the developmental capacity of the pathway. However to date,
72 no research has explored if biological maturity or other measures such as anthropometric, physical or
73 technical skill impact on talent identification of elite U16 Australian footballers, making it unclear what
74 factors drive identification at the initial stage of the AFL TP. Therefore, the aims of this study were
75 twofold, firstly to identify if maturational, anthropometric, physical or technical skill measures differ
76 between junior Australian footballers according to status (talent identified / non-talent identified). A
77 secondary aim of this study was to explore which measures could explain talent identification into the
78 AFL TP at the U16 level.

79 **Methods**

80 *Participants*

81 Participants (n=282, age 15.7 ± 0.3 years) were recruited from the U16 Western Australian
82 Football League competition. From this sample, two groups were examined; a talent identified group
83 (n=25, age 15.7 ± 0.3 years; defined as representatives of the 2015 Western Australian State U16
84 Academy) and a non-talent identified group (n=25, age 15.6 ± 0.4 years; defined as players not
85 identified on the 2015 West Australian State U16 Academy). The non-talent identified players were
86 randomly selected from the remaining 257 players not selected into the Academy using the random
87 sample function in SPSS version 22 (IBM, Chicago, IL, USA). In accordance with Woods et al. [14],
88 this randomisation process was implemented in order to generate a representative sample of the larger
89 cohort for comparative reasons. Further, between group differences were analysed to ensure the
90 included randomly selected non-talent identified sample were representative of the larger non-talent
91 identified sample, with no between-group differences evident ($p > 0.05$). To participate in the testing,
92 players were required to declare themselves to be injury free at the time of testing. The relevant Human
93 Research Ethics Committee provided ethical approval for the study with players and their guardians
94 required to provide informed consent prior to testing.

95 *Procedures*

96 Upon arriving at the testing session, the players initially had anthropometric information
97 recorded, being followed by the completion of two technical skill tests, and a series of five physical
98 tests. Anthropometric variables collected were standing and sitting height and body mass. All players
99 were then required to complete a standardised warm-up prior to the skills tests; the AFL's kicking and
100 handball efficiency test. Physical test completed included; a 20 m sprint, a stationary vertical jump
101 (SVJ), a dynamic vertical jump on both the dominant (DVJD) and non-dominant foot (DVJND), and
102 the 20 m multistage fitness test. A maximum of 40 players were tested at a time in three hour testing
103 sessions during the preseason phase of training.

104 Both standing and sitting height and body mass values were measured to the nearest 0.1 cm and
105 0.01 kg using a stadiometer (PE, Sportforce, Australia) and electric scales (Model UC-321, A&D

106 Mercury Pty. Ltd., Australia), respectively. To measure sitting height, players sat on a 42 cm seat, with
107 their buttocks and shoulders against the stadiometer. For all anthropometric measures players removed
108 their footwear. Biological maturity was estimated using the anthropometric measures collected, with
109 years to and from peak height velocity calculated using a standardised predictive equation [15]. This
110 method of assessment provides a reliable and practical method of assessing biological maturity and has
111 been used in a number of studies with similar populations [7, 9, 16].

112 The warm-up conducted prior to the skills testing included a light jog, a series of dynamic
113 stretches, and a basic handballing and kicking drill. The skills tests were conducted outside on an
114 outdoor playing field. All players were directed to wear their regular football boots. Both skills tests
115 used in this study were developed by the AFL and required the players to deliver a handball or kick to
116 a series of six targets across a range of Australian football specific distances. A reliable score of 0-5
117 was given by assessors [17] to rate each disposal for accuracy and trajectory. Previous research using
118 athletes and assessors of a similar demographic reported strong levels of inter-rater reliability for both
119 the kicking (ICC=0.96, $p<.01$) and handball tests (ICC=0.89, $p<.01$) [17]. Disposal distances for the
120 kicking test were short (20 m), medium (30 m) and long (40 m); whilst the handball test was short (6
121 m), medium (8 m) and long (10 m). For each distance a disposal was completed on the player's
122 dominant and non-dominant hand or foot, with skill executions to be completed in succession. Prior to
123 testing players nominated their preferred hand and foot, with players performing each test once.

124 After completion of the skill testing the group was taken inside to a gymnasium with hardwood
125 floors to complete the physical testing. Players wore standard running shoes for all physical
126 assessments. The physical tests were complete in a circuit fashion, with players randomly sub-divided
127 into four groups of approximately 10 and assigned to one of the four vertical jump or 20m sprint tests
128 stations. The 20 m multistage fitness test was conducted after the completion of all other tests, with the
129 players split into two equal groups to complete the test. Vertical jump tests were completed to assess
130 lower limb power. Prior to each jump, players were required to stand under a Vertec vertical jump
131 device (Swift Performance Equipment, Lismore, Australia), with both feet flat on the ground, then reach
132 up and displace the highest vane possible. This process was repeated three times, with the highest vane

133 displaced representing the individuals reach height. Players were asked to perform three counter-
134 movement jumps and three running vertical jumps on their dominant and non-dominant feet. Foot
135 dominance was defined as the players preferred kicking foot. For the running vertical jumps, players
136 were allowed a 5 m run up. Standing reach height was subtracted from each of the individual jumps to
137 give a relative jump height. Jump height was measured to the nearest 1 cm, with the largest of each
138 jump reported.

139 Sprint performance was evaluated by 20 m sprint time using infra-red timing gates (Smartspeed,
140 Fusion Sport Pty Ltd, Queensland, Australia). Players were instructed to self-start the test to remove
141 the effects of reaction time. Players were given three attempts with the fastest of the three trials recorded
142 to the nearest 0.01 of a second.

143 Aerobic fitness was conducted last to prevent fatigue in other tests and assessed via the multi-
144 stage fitness test. Players were required to run back and forth along a 20 m track, keeping time with a
145 series of audio beeps, with the frequency of beeps increasing as the test progressed. The test stopped
146 when the player reached voluntary exhaustion, or could no longer keep up with the beep frequency. The
147 stage and level achieved by each player was recorded. For analysis, the total distance was used which
148 was calculated from the players recorded shuttle stage and level.

149 *Statistical analysis*

150 Statistical analysis was undertaken using SPSS version 22 (IBM, Chicago, IL, USA). Mean and
151 standard deviation scores were calculated for all dependent variables (i.e. anthropometric, physical, and
152 technical skill measures). Prior to analysis, all data was screened for normality. A multivariate analysis
153 of variance (MANOVA) was used to explore the main effect of 'status' (two levels: talent identified,
154 non-talent identified) on the biological maturity, anthropometric, physical and technical skill variables.
155 The effect size (ES) of status on all measures was calculated using Cohen's *d* statistic. The magnitude
156 of the effect sizes were interpreted using a scale where values <0.2 are deemed trivial, 0.2–0.6 small,
157 0.6–1.2 moderate, 1.2–2.0 large and >2.0 very large [18]. For all analyses, the Type-I error rate was set
158 at $\alpha < 0.05$.

159 Binary logistic regression was used to determine which measures best explained the main effect
160 of selection (two levels: 1 =talent identified and 0 =non-talent identified). The full model was created
161 using all significant measures from the MANOVA. Subsequent models were constructed using a
162 backwards elimination method with the measure affecting the model the least subsequently removed
163 until only significant measures remained. Model fit was determined using the Akaike information
164 criterion (AIC). Odds ratio (OR) and 95% confidence intervals (95% CI) were reported for each
165 significant measure. Additionally, a receiver operator curve (ROC) was built to examine the
166 discriminative capability of the most parsimonious model by examining the area under the curve
167 (AUC). In accordance with recommendations provided by [4], the point on the curve at which the sum
168 of the talent identified and non-talent identified scores were maximised was considered the value of
169 which a “cut off” score can be considered for identifying players.

170 **Results**

171 According to Pillai’s trace (V), the MANOVA revealed a significant effect of status ($V = 0.57$,
172 $F(11, 38.000) = 4.56, p < .01$). Follow up univariate analysis revealed a significant effect of status on
173 biological maturity, standing and sitting height, DVJD foot, DVJND foot and the handball test (Table
174 1).

175 ******INSERT TABLE 1 ABOUT HERE******

176

177 ******INSERT TABLE 2 ABOUT HERE******

178

179 ******INSERT FIGURE 1 ABOUT HERE******

180

181 The six significant variables from the MANOVA were then included in the full logistic
182 regression model. A total of four models were developed (see Table 2), however the best reduced model
183 (AIC=52.52) included only standing height (OR=0.90, CI= 0.81-1.00, $p = .04$), DVJND foot (OR=0.73,

184 CI= 0.58-0.92, $p=.03$) and handball score (OR=0.88, CI= 0.78-0.98, $p<.01$) as the strongest model of
185 status (AUC=83.4%, CI= 72.1%-95.1%). The ROC was maximised when a cut-off score of 270.2 was
186 applied, with the final reduced model correctly identified 84% of the talent identified and 76% of the
187 non-talent identified players (Figure 1). According to the AUC the most robust single measure to
188 explain status was handball score (AUC=76.0%, CI= 62.5%-89.5%), with a value of 24.5/30 found to
189 optimise the ROC and correctly explain 60% of the talent identified and 80% of the non-talent identified
190 players. A standing height (AUC=72.8%, CI= 57.8%-87.8%) with a cut-off value of 179.9cm correctly
191 identifying 20 (80%) of the talent identified and 15 (60%) of the non-talent identified players. The
192 weakest measure from the most parsimonious model was the DVJND foot (AUC=72.6%, CI= 58.5%-
193 86.6%) with a cut-off value of 68.5 cm correctly classifying 16 (64%) of the talent identified and 17
194 (68%) of the non-talent identified players.

195 **Discussion**

196 Talent identified junior Australian footballers were biologically more mature than non-talent
197 identified players, and in addition were taller, and performed better in the DVJD foot, DVJND foot and
198 handball tests. Gastin and Bennett [7] reported maturational differences between community U15
199 Australian footballers, however this is the first study to demonstrate that age-matched talent identified
200 U16 Australian footballers are more mature than their non-talent identified counterparts. Between group
201 variations in maturity reported in this study are likely to contribute to the anthropometric and physical
202 performance differences demonstrated between the talent identified and non-talent identified groups, as
203 players of advanced maturational age are typically taller, heavier and have been shown to possess
204 greater vertical leaps than their less mature counterparts [7, 9, 19]. Maturational variation has previously
205 been shown to account for between 8-19% of physical performance variability and affect coaches'
206 perceptions of skill and potential in U16 Australian footballers [9, 10]. The greater anthropometric and
207 vertical jump measures reported in this study conforms to previous results examining U18 Australian
208 footballers who were talent identified [3, 4]. However at a U16 level this may be problematic as
209 performance advantages are likely related to biological maturity, rather than raw talent and long term
210 potential. Identification resulting from advanced maturity may negatively affect pathway efficiency as

211 physical advantages due to maturity have been shown dissipate with age [12], elevating the risk of
212 subsequent de-selection.

213 Handball performance was found to differ between talent identified and non-identified players
214 confirming the importance of technical skills to talent identification and selection in Australian football
215 [14, 20]. Currently it is unclear if performance in the AFL skill tests associate with skilful performance
216 in matches, which presents as a limitation to this study. However unlike anthropometric and physical
217 measures, performance in Australian football skill tests do not appear to be influenced by biological
218 maturity [9]. Coaches at an U16 level may therefore consider prioritising performance in skills tests
219 over anthropometric and physical measures during talent identification due to its unbiased nature.
220 Greater consideration of measures unaffected by maturity may improve talent identification processes
221 and development pathway efficiency. For example measures may also be extended to include
222 examination of psychological markers and decision-making tasks which have been shown to
223 discriminate between talent identified and non-talent identified U18 Australian footballers [20].
224 However, the effects of maturational variance on new identification assessments need to be explored
225 before including in the talent identification processes.

226 Australian football is a multidimensional team sport which requires players to possess well
227 developed physical, technical and tactical skills to perform at a high level [14]. As such, several studies
228 have examined if physical [4, 5, 22], skill [20] and decision making [21] measures can explain talent
229 identification in U18 Australian football. The results of this study demonstrate a combined set of
230 physical and technical measures can explain talent identification into an elite U16 Australian football
231 team. The strongest model correctly identified 84% of the talent identified and 76% of the non-talent
232 identified players, with this model including the measures of standing height, DVJND foot and handball
233 efficiency. Using this model and the ROC a score of 270.2 was determined to be an acceptable cut-off
234 value for identifying potentially elite U16 Australian footballers. This study, when coupled with the
235 findings of Woods, Raynor [14] further highlights the need for a multidimensional approach to talent
236 identification in junior team sports, such as Australian football. However when considered in
237 conjunction with the low retention of players from U16 to U18 squads [6], this study highlights a clear

238 need to factor assessments of biological maturity in identification measures of U16 players.
239 Consideration of maturity and prioritisation of tests unbiased by maturation may help improve long-
240 term pathway outcomes by ensuring later developing adolescent players are not misidentified early in
241 development pathways due simply to disadvantages associated with being biologically younger.

242 **Conclusion**

243 This research provides first evidence that players identified onto the AFL TP at the U16 level
244 are likely to be more biologically mature than their non-talent identified counterparts. Further,
245 differences were evident between talent identified and non-talent identified players in measures of
246 standing and sitting height, DVJD foot, DVJND foot and handball test scores. The results of this
247 research have implications for current talent identification methods as both standing height and DVJND
248 foot have previously been shown to be influenced by maturational variation [9]. The strongest measures
249 able to define status were reduced to three variables, standing height, DVJND foot and handball score.
250 Given that handball test performance is unaffected by maturational variation [9], coupled with the
251 results of this study, coaches should prioritise performance in technical skill assessments over physical
252 testing measures during the talent identification process. The consideration of biological maturity and
253 prioritisation of talent identification measures unbiased by maturation such as technical skills tests, may
254 improve athlete retention outcomes in the AFL TP by preventing the initial misidentification of players
255 potentially physically advantaged or disadvantaged at 16 years of age.

256 **References**

- 257 1. Pyne, D., Gardner, A., Sheehan, K., Hopkins, W. Fitness testing and career progression
258 in AFL football. *J Sci Med Sport* 2005; 8: 321-332.
- 259 2. Matthys, S., et al., A. longitudinal study of multidimensional performance
260 characteristics related to physical capacities in youth handball. *J Sports Sci* 2012; 31:
261 325-334.
- 262 3. Veale, J.P., Pearce, A.J, Koehn, S., Carlson, J.S. Performance and anthropometric
263 characteristics of prospective elite junior Australian footballers: A case study in one
264 junior team. *J Sci Med Sport* 2008; 11: 227-230.
- 265 4. Woods, C., Rayner, A., Bruce, L., McDonald, Z., Collier, N. Predicting playing status
266 in junior Australian Football using physical and anthropometric parameters. *J Sci Med
267 Sport* 2015; 18: 225-229.
- 268 5. Robertson, S., Woods C., and Gastin P. Predicting higher selection in elite junior
269 Australian Rules football: The influence of physical performance and anthropometric
270 attributes. *J Sci Med Sport* 2015; 18: 225-229.
- 271 6. Cripps, A.J., Hopper, L., Joyce C. and Veale J. Pathway Efficiency and Relative Age
272 in the Australian Football League Talent Pathway. *Talent Dev Excell* 2015; 7: 3-11.
- 273 7. Gastin, P.B., Bennett, G. Late maturers at a performance disadvantage to their more
274 mature peers in junior Australian football. *J Sports Sci* 2013; 32: 563-571.
- 275 8. Buchheit, M. and Mendez-Villanueva, A. Effects of Age, Maturity and Body
276 Dimensions on Match Running Performance in Highly Trained Under-15 Soccer
277 Players. *J Sports Sci* 2014; 32: 1271-1278.

- 278 9. Cripps, A.J., Hopper L., and Joyce C. Maturity, physical ability, technical skill and
279 coaches' perception of semi-elite adolescent Australian footballers. *Pediatr Exerc Sci*.
280 Epub ahead of print 2016. DOI: <http://dx.doi.org/10.1123/pes.2015-0238>.
- 281 10. Cripps, A.J., Hopper, L., and Joyce, C. Coaches' perceptions of long-term potential are
282 biased by maturational variation. *Int J Sports Sci Coach*. Epub ahead of print 2016.
283 DOI: 10.1177/1747954116655054.
- 284 11. Armstrong, N. *Paediatric Exercise Physiology. Advances in Sport and Exercise Science*
285 *Series*. Edinburgh: Churchill Livingstone Elsevier, 2007.
- 286 12. Till, K., Cogley, S., O'Hara, J., Cooke, C. and Chapman, C. Considering Maturation
287 Status and Relative Age in the Longitudinal Evaluation of Junior Rugby League
288 Players. *Scand J Med Sci Sports* 2014; 24: 569-576.
- 289 13. Schorer, J., Cogley, S., Busch., Brautigam, H. and Baker, J. Influences of competition
290 level, gender, player nationality, career stage and playing position on relative age
291 effects. *Scand J Med Sci Sports* 2009; 19: 720-730.
- 292 14. Woods, C., Raynor, A., Bruce, L., McDonald, Z., and Robertson, S. The application
293 of a multi-dimensional assessment approach to talent identification in Australian
294 football. *J Sports Sci* 2016; 34: 1340-1345.
- 295 15. Mirwald, R.L., Baxter-Jones, A.D., Bailey, D.A. and Beunen, G.P. An Assessment of
296 Maturity from Anthropometric Measures. *Med Sci Sports Exerc* 2002; 34: 689-694.
- 297 16. Gastin, P.B., Bennett, G., and Cook, J. Biological Maturity Influences Running
298 Performance in Junior Australian Football. *J Sci Med Sport* 2013; 16: 140-145.
- 299 17. Cripps, A.J., Hopper, L., and Joyce C. Inter-rater reliability and validity of the
300 Australian Football League's Kicking and Handball tests. *J Sport Sci Med* 2015; 14:
301 675-680.

- 302 18. Hopkins, W., Marshall, S., Batterham, A., Hanin, J. Progressive statistics for studies in
303 sports medicine and exercise science. *Med Sci Sports Exerc* 2009; 41: 3-13.
- 304 19. Malina, R., Eisenmann, J., Cummin, S., Riberio, B, Aroso, J. Maturity-associated
305 variation in the growth and functional capacities of youth football (soccer) players 13–
306 15 years. *Eur J Appl Physiol* 2004; 91: 555-562.
- 307 20. Woods, C., Rayner, A., Bruce, L., McDonald, Z. The use of skill tests to predict status
308 in junior Australian Football. *J Sports Sci* 2015; 33: 1132-1140.
- 309 21. Woods, C., Rayner, A., Bruce, L., McDonald, Z. Discriminating talent-identified junior
310 Australian football players using a video decision-making task. *J Sports Sci* 2016; 34:
311 342-347.
- 312 22. Keogh, J. The use of physical fitness scores and anthropometric data to predict selection
313 in an elite under 18 Australian rules football team. *J Sci Med Sport* 1999; 2: 125-133.
314

315 **Table 1.** Between group differences for anthropometric, physical and technical skill measures (mean
 316 \pm standard deviation).

Measure	Talent Identified	Non-talent Identified	Effect size (Cohen's <i>d</i>)
Height (cm) ^b	183.06 \pm 9.75	176.39 \pm 6.05	0.82
Sitting Height (cm) ^a	92.65 \pm 4.45	90.04 \pm 4.04	0.61
Weight (kg)	72.21 \pm 7.84	67.79 \pm 9.40	0.52
Y-PHV ^a	1.98 \pm 0.66	1.55 \pm 0.68	0.65
SVJ (cm)	60.20 \pm 5.28	57.80 \pm 6.18	0.42
DVJD (cm) ^a	66.00 \pm 7.36	61.00 \pm 8.50	0.63
DVJND (cm) ^b	73.40 \pm 8.11	66.72 \pm 6.58	0.91
20m Sprint (s)	3.04 \pm 0.11	3.09 \pm 0.10	0.48
Shuttle Distance (m)	2282.88 \pm 320.96	2167.64 \pm 214.73	0.42
Kicking Test	14.44 \pm 3.04	13.60 \pm 3.14	0.27
Handball Test ^a	24.84 \pm 3.26	21.04 \pm 4.68	0.94

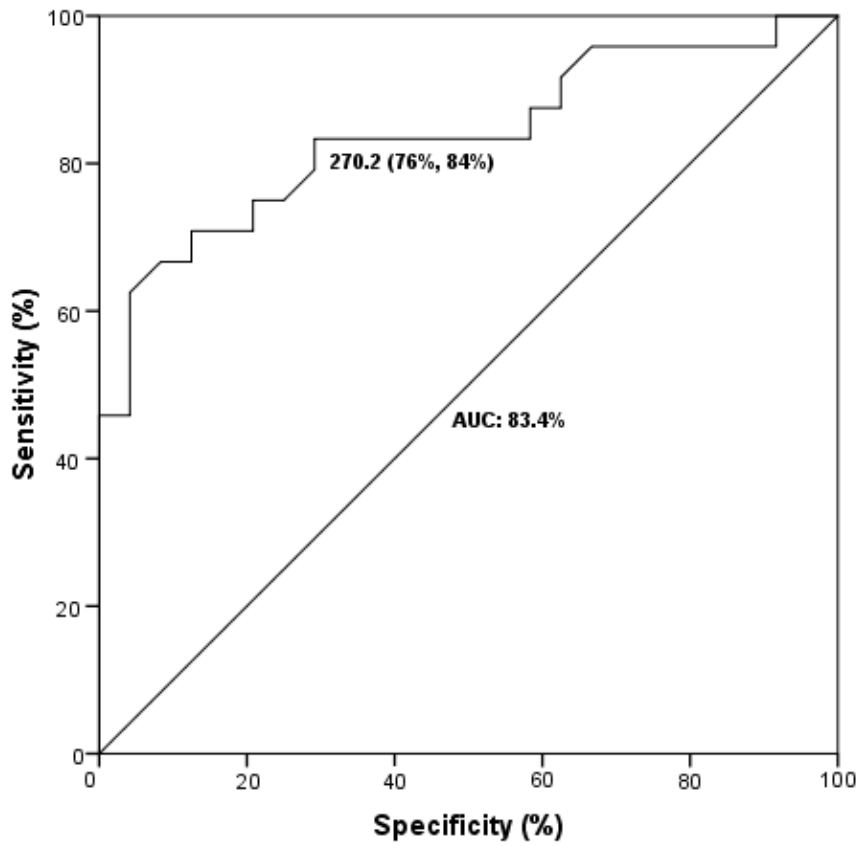
317 ^a $p < .05$. ^b $p < .01$

1 **Table 2.** Model summary relating to the binary logistic models run.

Measure	Model 1				Model 2			
	β (SE)	χ^2	p	OR (95% CI)	β (SE)	χ^2	p	OR (95% CI)
Constant	12.57 (26.64)	0.22	0.64		4.86 (23.93)	0.04	0.84	
Standing Height (cm)	-0.19 (0.11)	3.21	0.07	0.82 (0.67-1.02)	-0.17 (0.10)	2.97	0.08	0.84 (0.69-1.02)
Handball	-0.34 (0.13)	6.61	0.01	0.71 (0.55-0.92)	-0.34 (0.13)	7.18	0.01	0.71 (0.55-0.91)
DVJD (cm)	-0.12 (0.06)	3.63	0.06	0.88 (0.78-1.00)	-0.13 (0.06)	4.62	0.03	0.88 (0.78-0.99)
Sitting Height (cm)	0.49 (0.39)	1.59	0.21	1.63 (0.76-3.48)	0.53 (0.38)	1.94	0.16	1.70 (0.81-3.57)
Y-PHV	-2.15 (2.09)	1.09	0.30	0.12 (0.01-7.01)	-2.57 (1.99)	1.67	0.20	0.076 (0.01-3.77)
DVJND (cm)	-0.05 (0.07)	0.46	0.49	0.96 (0.84-1.01)				
AIC		55.89				54.34		
Measure	Model 3				Model 4			
	β (SE)	χ^2	p	OR (95% CI)	β (SE)	χ^2	p	OR (95% CI)
Constant	33.07 (11.37)	8.47	<0.01		34.97 (11.08)	9.96	0.02	
Standing Height (cm)	-0.15 (0.09)	2.66	0.10	0.86 (0.72-1.03)	-0.10 (0.52)	3.94	0.04	0.90 (0.81-1.00)
Handball	-0.32 (0.12)	7.07	0.01	0.73 (0.57-0.92)	-0.31 (0.12)	6.95	<0.01	0.73 (0.58-0.92)
DVJD (cm)	-0.12 (0.06)	4.41	0.04	0.88 (0.79-0.99)	-0.13 (0.06)	4.93	0.03	0.88 (0.78-0.98)
Sitting Height (cm)	0.11 (0.18)	0.39	0.54	1.12 (0.79-1.58)				
AIC		54.14				52.52		

2 Abbreviations: β , beta coefficient; SE, standard error; χ^2 , Wald chi-squared; AIC, Akaike information criterion. Statistical significance accepted
3 at $p < 0.05$.

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2

3 **Figure 1.** Receiver operating curve for the most parsimonious model which included standing
4 height, DVJND foot and handball parameters.

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