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# Talent identification and selection in elite youth football: An Australian context

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**Abstract**
We identified the perceptual–cognitive skills and player history variables that differentiate players selected or not selected into an elite youth football (i.e. soccer) programme in Australia. A sample of elite youth male football players ($n = 127$) completed an adapted participation history questionnaire and video-based assessments of perceptual–cognitive skills. Following data collection, 22 of these players were offered a full-time scholarship for enrolment at an elite player residential programme. Participants selected for the scholarship programme recorded superior performance on the combined perceptual–cognitive skills tests compared to the non-selected group. There were no significant between group differences on the player history variables. Stepwise discriminant function analysis identified four predictor variables that resulted in the best categorization of selected and non-selected players (i.e. recent match-play performance, region, number of other sports participated, combined perceptual–cognitive performance). The effectiveness of the discriminant function is reflected by 93.7% of players being correctly classified, with the four variables accounting for 57.6% of the variance. Our discriminating model for selection may provide a greater understanding of the factors that influence elite youth talent selection and identification.

**Keywords:** *Team sport, skill, performance, prediction*



Talent identification and selection for youth development programmes is based on the ability of coaches and talent identifiers to predict future sporting success based on current youth performance. An issue with talent identification and development programmes is the assumption that the factors which contribute to successful senior performance can be generalized and measured within an adolescent group to predict future senior ability (Deprez et al., 2015; Vaeyens, Lenoir, Williams, & Philippaerts, 2008). Several researchers have used cross-sectional approaches to explore the factors that may contribute to successful adult and adolescent sporting performance, including technical (Coelho e Silva et al., 2010; Figueiredo, Gonçalves, Coelho e Silva, & Malina, 2009; Vaeyens et al., 2006), perceptual–cognitive (Ward & Williams, 2003; Ward, Ericsson, & Williams, 2013; Williams, Hodges, North, & Barton, 2006), physical (Coelho e Silva et al., 2010; Figueiredo et al., 2009; Gonaus & Müller, 2012), and psychological factors (Toering, Elferink-Gemser, Jordet, & Visscher, 2009). Yet, there remains limited understanding of the factors considered important when selecting players from a prior regional adolescent talent development programme for an elite national talent development programme.

Within Australia, the football (i.e. soccer) talent development pathway involves youth players from 11 years old being identified and selected for elite age-related regional (i.e. state regions) teams. These teams generally train two to three times per week and then compete at an annual national championship from the age of 13 years. From this Under 13 age-related championships, players are monitored over subsequent years. Following the Under 15 years national championships, a limited number of scholarships (approximately 22) are offered for a

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prestigious residential elite national talent development programme. Acceptance into this programme is seen as one of the final stages in a player's development to a professional level, with players regularly competing against international teams with the goal to qualify and compete at the youth football World Cup. Most players who receive a scholarship and complete the two-year programme go on to sign contracts with professional football clubs.

The current adolescent selection process is based on a group of national talent selectors that rely on their expertise in domain-specific talent selection (Gil et al., 2014). Researchers have generally focussed on the comparisons between distinct skill levels on numerous football-specific measures (Gonaus & Müller, 2012; Ward et al., 2013), retrospective analysis of time invested in sport-specific activities which may lead to elite performance (Ford, Ward, Hodges, & Williams, 2009; Haugaasen, Toering, & Jordet, 2014; Hornig, Aust, & Güllich, 2016; Ward, Hodges, Starkes, & Williams, 2007; Zibung & Conzelmann, 2013), or the comparisons of players maintained or released from an elite programme (Anderson & Miller, 2011; Ford et al., 2009; Ford & Williams, 2012; Güllich, 2014). There has been limited exploration of the potential factors that may influence the selection process during the transition from a prior talent development programme at a regional level into an elite national talent development programme.

Researchers have used the expertise approach to understand the differences in perceptual–cognitive performance and time invested by athletes in sport-specific activities during development to understand the advantage skilled athletes possess over less-skilled counterparts (Ford et al., 2009; Ford & Williams, 2012; Ward et al., 2007; Ward et al., 2013). These investigations have demonstrated an expert advantage for decision-making, anticipation, situational probability, and pattern recognition (Ward et al., 2013; Ward & Williams, 2003), and skilled players accumulate more hours in domain-specific activities, such as competition, training and play (Ford et al., 2009; Ward et al., 2007). Although these investigations indicate the differences between skilled and less-skilled athletes, there remains limited understanding of the influence of these variables on the selection of elite regional youth players into an elite national talent development programme.

An issue with current talent identification and development programmes is the ability to predict future success based on the measurements of adolescent performance (Deprez et al., 2015; Vaeyens et al., 2008). While many researchers have provided a descriptive understanding of the skills or attributes that may differentiate performance, few have attempted to identify the factors which may influence the selection process from a prior regional talent development programme into an elite national talent development programme. Therefore, in this study we identify the perceptual–cognitive skills and player history variables that may discriminate players selected or not selected into an elite Australian youth football programme and develop a discriminative model of this selection process.

## Method

Elite youth male football players ($n = 127$; $\text{Mean}_{age} = 14.8$ years, $\text{Standard Deviation}_{age} = 0.49$) volunteered to participate. All participants were competing at the Under 15 years national youth football championships in Australia following their earlier selection into a regional youth football development programme. During the tournament, a team of experienced national talent selectors ($n = 7$) identified 22 players who were to be offered a full-time scholarship for an elite player residential programme. Ethical approval was gained from the lead institution's research ethics board and written parental consent was obtained for all players prior to data collection.

In small groups (approximately 16), participants first completed an adapted version of the Participation History Questionnaire (PHQ: Ward et al., 2007) to gather data relating to the players date of birth, region (i.e. state they play football), football milestones (i.e. began playing for state or representative teams) and football-related activities which players had undertaken from the current season back to eight years of age. Similar to Larkin, O'Connor, and Williams (2015a; 2015b), the questionnaire elicited information relating to the number of hours participants engaged in football-related activities at a specific age such as: match-play (i.e. competitive football matches); coach-led practice (i.e. football practice with a coach); individual practice (i.e. football activity by oneself); peer-led play (i.e. football activities with peers, including small-sided games), and indirect involvement (i.e. football activities not physical in nature, such as playing football computer games and watching football games). Participants recalled the hours per week and months per year they spent doing the activities and the number of weeks they were injured during a specific year. Concurrent validity and test–retest reliability of the PHQ has been previously reported (Ford, Low, McRobert, & Williams, 2010). Participants took approximately one hour to complete the questionnaire.

In addition to sport-specific engagement, recent match-play performance was measured. Within the

Australian system, nine months prior to the scholarship selection process a group of approximately 50 players who have been identified during the Under 14 years national football championships are invited to a minimum of three out of a total of seven training camps each lasting three days between January and July. During these camps, which generally involve 27 players, players engage in small and large-sided games to subjectively assess technical, tactical, and perceptual–cognitive ability. Following the seven camps, and six months prior to the scholarship selection, a squad of 25 players competes at an Association of South East Asian National Football Federation tournament. Participation in these camps (i.e. selected for camps) and tournament (i.e. selected to compete) provide an indicator of recent skilled-match-play performance, and was thus interpreted in this manner.

Following the completion of the questionnaire, participants then completed an adapted version of the perceptual–cognitive video-based assessment procedure (Larkin et al., 2015a) used to evaluate the perceptual–cognitive skills of the participants. Four activities were completed sequentially including, decision-making, anticipation, situational probability, and pattern recognition. Three activities (i.e. decision-making, situational probability, and pattern recognition) were administered in the same manner as reported by Larkin and colleagues (2015a). Participants were presented 20 video-clips of elite level offensive football sequences which were occluded at a key moment and prompted a response from the participant according to the activity aim (i.e. decision-making, what game action to perform next based on the presentation; situational probability, ability to assess situational information regarding most likely options; pattern recognition, identification of previously presented football game-play information). We added an anticipation test to the battery which was presented in the same manner as the decision-making activity, however, participants were required to predict what action the player with the ball at the point of occlusion would do next (i.e. pass, run with the ball, or shoot). Participants were asked to make a response based on three possible decision outcomes: (a) pass the ball (P); (b) run with the ball (R/D); or (c) shoot at goal (S). To respond, a picture of the last frame of the video was provided with participants asked to indicate the game action (i.e. P; R/D; S) and the direction in which the game action would take place (i.e. draw an arrow in that direction). Each trial was scored out of 2, with one point being allocated for the correct direction (as indicated by the arrow) and one point for indicating the correct game action (i.e. pass, run or shoot), with a total score of 40 points possible. The scoring system outlined by Larkin and colleagues (2015a) was used for the decision-making, situational probability and pattern recognition activities. The activities were projected on to a screen (2.1 m) with participants seated within clear view of the screen (approximately 5–7 m away). The video-based task took approximately one hour to complete.

The correct responses for the perceptual–cognitive activities were determined by an expert panel of elite level youth coaches ($n = 5$) who are currently coaching Australian international youth teams. The coaching panel were presented with the clips, and individually recorded their response. All responses were collated and any discrepancies in the outcome of the clip discussed in a round table forum until 100% agreement was reached. For analysis purposes, the outcomes decided upon by the coaches were deemed as correct.

For the PHQ, to ensure consistency with previous findings (Ford et al., 2012; Ford & Williams, 2012; Roca, Williams, & Ford, 2012), football-related activities were grouped into three activity types, match-play, training (i.e. coach-led and individual practice), and peer-led play. Accumulated hours of engagement in football-related activities was calculated by multiplying the reported hours per week by weeks per year, minus the number of weeks participants reported as injured. To calculate accumulated hours of indirect involvement, reported hours per week were multiplied by the reported weeks per year.

For the region variable, participants were allocated an ordinal variable based on a random number allocation for each of the nine regions (e.g. New South Wales; Northern New South Wales; Queensland; Victoria; South Australia; Tasmania; Western Australia; Australia Capital Territory; Northern Territory). For the recent match-play performance variable, participants were allocated an ordinal variable based on level of performance, a one was allocated to the participants who competed at the international tournament; a two was allocated to the participants that participated in the camps, but were not selected for the tournament; a three was allocated to the individuals who were not selected for either the camp or the tournament. Total score for each perceptual–cognitive activity was calculated and converted to a percentage score for analysis. In addition to performance on the individual video-based activities, as perceptual–cognitive performance has been reported to include many different skills (Williams, Ward, Bell-Walker, & Ford, 2012), including the ones outlined in this test, a combined percentage was computed for analysis purposes. As perceptual–cognitive performance was measured on a positive scale, and the recent match-play performance was measured on an inverse scale (i.e. low value equals better

performance) to ensure both variables are measured on the same scale in the discriminant analysis, an inverse percentage score was used for perceptual–cognitive performance. Therefore, perceptual–cognitive performance was considered relative to the percentage of incorrect responses, whereby a lower score represented better performance (i.e. lower percentage indicates less errors).

The descriptive statistics (mean ± standard deviation) were used to describe playing history and perceptual–cognitive performance. As the selection for a scholarship is based upon the two-year cycle of the Under 17 World Cup, players from two age ranges (i.e. Under 15 and Under 14 years) were selected for a scholarship with analysis indicating seven players were from the Under 14 age range. Therefore, the history data was calculated relative to the average hours per month individuals invested in football-specific activities rather than total accumulated hours.

To assess group differences (i.e. selected and non-selected) on all the variables, individual one-way analysis of variance (ANOVA) were conducted. Furthermore, Chi-square ($\chi^2$) analysis was conducted to identify group differences on categorical variables such as team and prior international competitive experience. Stepwise discriminant analysis was then conducted with selection into the elite talent development programme as the dependent variable. A significant alpha was set at 0.05, with effect sizes calculated by a partial eta-squared ($\eta^2$) and described as a small ($\eta^2 = 0.01$–$0.058$), medium ($\eta^2 = 0.059$–$0.137$), or a large ($\eta^2 \geq 0.138$) effect size (Cohen, 1992).

## Results

The descriptive statistics (mean ± standard deviation) for the variables player history and perceptual–cognitive activities, when the cohort was separated by elite talent development programme selection, are presented in Table 1. Separate one-way ANOVA's demonstrated a significant main effect for group, with the participants who were selected for the scholarship recording better combined perceptual–cognitive performance scores compared to the non-selected group ($p = .030$, $\eta^2 = 0.038$). When considering performance on the individual perceptual–cognitive activities, while the selected group performed better on the majority of the activities, only on the decision-making activity did the selected group perform significantly better than the non-selected group ($p = .001$, $\eta^2 = 0.090$). There were no significant between group differences for any of the player history variables.

There was no main effect for age; however, seven players were selected from the younger Under 14 age range (approximately a third of all selected players). To determine whether there was an association between selection and the team players competed in at the National Championships a Chi-square analysis was conducted. Results indicated an unequal distribution with a high proportion of selected players coming from two states (i.e. New South Wales, Queensland), $\chi^2(7, n = 22) = 35.72$, $p < .001$. Furthermore, a Chi-square analysis indicated the distribution of players who had played at an international competition prior to the championships differed significantly between the groups, $\chi^2(1, n = 127) = 75.42$, $p < .001$.

Stepwise discriminant function analysis identified four predictor variables that resulted in the best categorization of selected and non-selected players, $\Lambda = 0.42$, $\chi^2(4) = 103.74$, $p < .01$. The effectiveness of the discriminant function is reflected by the fact that 93.7% of players were correctly classified. Validation of the model was conducted using the leave-one-out method of cross-validation resulting in 93.7% of participants being correctly classified. Large standardized coefficients for recent match-play performance (0.851), region they competed for at the national championships (0.472), number of other sports participated in (0.350), and combined perceptual–cognitive percentage of incorrect responses (0.261) reflects the importance of these variables. The eigenvalue for this model was 1.357, which suggests the discriminating power of the model was quite high, with a canonical correlation of 0.759, indicating that the four variables accounted for 57.6% of the variance. The following equation was found to predict selection into the football centre of excellence:

a) Discriminant analysis to predict selection to centre of excellence/AIS scholarship:

Discriminant score = -14.024 + 0.128 (Region) + 1.847 (recent match-play performance) + 1.156 (Number of other sports participated) + 0.048 (Combined Perceptual–Cognitive percentage of incorrect responses).

## Discussion

We examined whether football-specific practice history, recent match-play performance, and perceptual–cognitive skills variables may differentiate players selected or not selected for an elite player residential football programme scholarship in Australia. Players selected and not selected for an elite youth talent development programme differed in terms of

Table 1. Mean (± SD) for hours per month of soccer-specific activity and perceptual–cognitive performance of Australian youth soccer players competing in the Under 15 National Championships are separated based on selection or non-selection for a full-time elite player scholarship.

| | Selected | | Not Selected | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | *F* | *p*-value | Effect Size ($\eta^2$) | |
| Months old | 14.68 | 0.48 | 14.76 | 0.49 | 0.46 | .500 | 0.004 | Small |
| Match-play (hours/month) | 5.75 | 1.72 | 6.89 | 2.55 | 3.24 | .074 | 0.026 | Small |
| Coach-led practice (hours/month) | 19.01 | 4.93 | 18.66 | 7.16 | 0.00 | .952 | 0.000 | Small |
| Individual practice (hours/month) | 12.41 | 6.97 | 12.45 | 7.75 | 0.30 | .586 | 0.002 | Small |
| Peer-led play (hours/month) | 17.38 | 6.95 | 19.24 | 9.29 | 2.12 | .148 | 0.017 | Small |
| Indirect involvement (hours/month) | 36.46 | 20.08 | 39.26 | 21.49 | 0.69 | .426 | 0.005 | Small |
| Decision-making (%) | 69.29* | 10.77 | 59.12 | 12.80 | 12.02 | .001 | 0.090 | Medium |
| Anticipation (%) | 63.21 | 12.57 | 58.96 | 12.55 | 2.08 | .152 | 0.017 | Small |
| Situational probability (%) | 68.24 | 6.03 | 66.43 | 5.62 | 1.83 | .179 | 0.015 | Small |
| Pattern recognition (%) | 71.14 | 16.4 | 71.88 | 14.80 | 0.04 | .836 | 0.000 | Small |
| Combined perceptual–cognitive performance (%) | 65.07* | 6.07 | 62.23 | 5.31 | 4.85 | .030 | 0.038 | Small |
| Number of other sports participated | 3.36 | 2.56 | 4.01 | 3.20 | 0.50 | .482 | 0.004 | Small |

*Indicates a significant difference at the .05 level.



their combined perceptual–cognitive expertise, specifically decision-making performance. A further aim was to develop a discriminative model to predict selection into an Australian elite youth football specific programme. The discriminative model indicated 93.7% of the participants were correctly classified as selected or not selected for an elite talent development programme. The findings suggest elite youth talent selectors consider multivariate interactions and not just an additive or single factor approach for talent selection.

With respect to the perceptual–cognitive skills tests, results indicate that the selected group performed significantly better, in particular the decision-making task, compared to the non-selected group. This finding corroborates previous research which demonstrates decision-making performance can differentiate skilled and less-skilled football players (Ward et al., 2013; Ward & Williams, 2003). These findings may indicate a perceptual–cognitive advantage which is evidenced by better decision-making and selection to an elite youth level. The results suggest video-based measures of perceptual–cognitive skills may be an effective supplementary tool within the multivariate identification and selection process for elite level talent programmes. Such tests are not currently used routinely.

There were no significant differences between the selected and non-selected on the anticipation, situational probability, or pattern recognition tasks. This finding was unexpected given that it is reported that these measures discriminate between skilled and less-skilled/novice players (see Ward et al., 2013; Ward & Williams, 2003; Williams, North, & Hope, 2012). Since in the current study all the players had been selected to compete for their region at an elite national competition it may be presumed that the players are not too far apart on a skill level continuum (i.e. all elite level youth players). A suggestion is that these tests may not be sensitive enough to discriminate players that are very close together on the skill continuum. Alternatively, we speculate that the perceptual–cognitive skills underpinning anticipation such as the use of situational probabilities, the pick-up of postural cues, and patterns of play may be less cognitively demanding compared to decision-making. The ability to make decisions may be a higher-order cognitive process compared to anticipation requiring greater synthesis and understanding of information and that consequently, such cognitive skills may be more discriminating than tests that solely measure the perceptual–cognitive skills underlying anticipation. Further research is needed to explore the above issues.

Researchers have indicated there is no difference in the hours invested in football specific coach-led practice between elite and sub-elite youth players (Ford et al., 2009; Huijgen, Elferink-Gemser, Post, & Visscher, 2009; Huijgen, Elferink-Gemser, Post, & Visscher, 2010; Ward et al., 2007). Our results support these findings with similar amounts of time invested in coach-led practice per month at the youth level. This finding would reflect the guidelines in the FFA national curriculum for youth players, which recommends approximately three sessions of 90 minutes per week. In contrast, it has been reported the accumulation of hours in football-specific peer-led and individual activities can differentiate players who are selected or not-selected for elite youth training academies (Ford et al., 2009); however, the current findings contradict existing findings. A potential explanation may be due to the relatively

low number of hours elite Australian youth players accumulate in peer-led and individual activities compared to other football nations (Ford et al., 2009; Ford & Williams, 2012; Helsen, Starkes, & Hodges, 1998; Ward et al., 2007). Further research exploring the reasons why play and individual practice is relatively low among elite youth players would be beneficial as it has been suggested that this is an important element of player development (Ford et al., 2009; Ford & Williams, 2012; Williams et al., 2012).

While the results indicate there is no difference in age between the two groups of players, seven players from a younger age group (Under 14) were selected for the scholarship programme. Researchers have indicated players born earlier in the selection year will most likely experience more success compared to players born later in the selection year due to their physical advantage, which may provide a perception they may be more talented compared to relatively younger peers (Cobley, Hanratty, O'Connor, & Cotton, 2014; Helsen, Hodges, Van Winckel, & Starkes, 2000). The physical advantage held by the relatively older players has a potential impact on the selection for further developmental opportunities, especially for competitions with 24-month age bands, such as the Under 17 World Cup (Helsen, Van Winckel, & Williams, 2005). The current selection may indicate national talent selectors are aware of relative age and maturity effects and try not to base selection on age or physical attributes alone, even though the selected group will compete at a 24-month age-band competition, the Under 17 World Cup. This notion is supported by the even quartile birthday distribution of the seven players selected from the younger age group (i.e. approximately one-third of the selected group). This finding may indicate that Australian elite youth talent selectors de-emphasize the importance of physical characteristics when identifying or selecting elite youth talent.

With respect to predictor variables from the discriminant model, the strongest predictor was recent match-play performance. Three months prior to scholarship selection 25 players from a squad of 50 players were selected to compete at an international U16 tournament in South East Asia. The tournament was conducted over two-weeks with six matches played with the team finishing third (from 10 countries). This international experience presents a great learning opportunity in relation to playing under pressure, against unknown international opposition, and coping with travel. In relation to talent identification and development, a player's recent match-play performance is one of the strongest predictor variables which contribute to the selection for a scholarship. As such what a coach see's in a player's recent match-play performance may influence the selection of process for scholarships. Therefore, from a talent identification perspective, researchers should consider investigating and understanding the factors or skills coaches/selectors may consider when evaluating a players match-play performance.

The inclusion of region within the model suggests that the location a player comes from may influence the selection for a scholarship, with the majority of players selected coming from New South Wales and Queensland. It has been suggested that certain geographical areas may produce more talent (Baker, Schorer, Cobley, Schimmer, & Wattie, 2009; Kyttä, 2002). However, based on the current findings it is still unclear whether these regions provide a hotbed that fosters talent development. While all regions competing at the national tournaments have regional programmes underneath the national football federation, the current study did not assess the qualifications or coaching quality across the different state teams. It may be possible certain coaching environments may enhance player development. In future, researchers should consider the potential influence coach behaviour and/or environment have on a player's potential to obtain a scholarship position.

The model also indicated the number of other sports participated in is a predictor variable for selection of a scholarship. While the results do not indicate a statistically significant difference, the descriptive results tentatively suggest the selected players have participated in less other sports during their development compared to the non-selected players. The Australian participants on average participate in more other sports outside of football when compared to elite youth players from other nations ($n = 2.5$; Ford et al., 2012; $n = 1.0$; Haugaasen et al., 2014). While researchers have indicated the potential benefits for skill transfer associated with participating in sports outside of football (Haugaasen et al., 2014), a limitation of the current investigation is the paucity of knowledge regarding the level of commitment to these outside sports. Gaining a greater understanding of the level of participation (e.g. recreational, regional, national) and the time invested in these sports, may provide some indication of the potential benefits to football-related performance. In addition participation in sports outside of football may reduce the time available for football-specific engagement and potentially explain the comparatively lower football-specific play hours reported here when compared with other nations (Ford et al., 2009; Ford et al., 2012; Helsen et al., 1998; Ward et al., 2007). In future, researchers should consider all aspects of

sport engagement rather than just an isolated investigation into the primary sport engagement.

## Conclusions

The findings of this study demonstrate differences in perceptual–cognitive skill between players selected and not selected for an elite youth talent development programme, specifically decision-making performance. A discriminative model to predict selection into an elite youth residential football programme in Australia was presented. We conclude that talent selectors consider a number of variables during the selection process from a regional talent development programme into an elite national talent development programme. These factors included recent match-play performance and perceptual–cognitive/decision-making ability. This finding suggests that selectors should consider multivariate interactions when identifying and selecting players rather than using an additive approach where individual performance ratings in separate areas inform the selection process.

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