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An examination of the progression from national schoolboy to senior representation in Australian rugby union

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ABSTRACT

The aim of this paper was to investigate whether playing National Schoolboy Rugby Union was a precursor to senior representative Rugby Union. Within the central aim other sub contexts were also explored. These being, the type of school attended, the State in which athletes lived and the number of years of representation at National Schoolboy level. A prospective analysis of 984 Australian Schoolboy Rugby Union players (1973-2008) was conducted. The analysis included the number of years the players had been selected, the type of school (Government versus Non-Government) and the State in which they attended school. Players were categorised into 3 areas, (i) no participation in senior representative level, (ii) represented at Provincial level and (iii) represented at National level. In addition, 267 players who debuted for the Australian National Rugby Union team between 1977-2012 were also analysed retrospectively and separated into 2 categories, those who had previously represented the Australian Schoolboy team and those who had not. It was discovered that 12.7% of Australian Schoolboy players progressed to represent at the senior National level. Within these findings it was identified that attendance at Non-Government schools was advantageous for selection at both the Schoolboy and senior representation. New South Wales had the highest number of athletes selected at both National Schoolboy and senior representative teams, however when compared to the expected mean distribution of the Australian population, significantly more players were from the Australian Capital Territory. It was also identified that athletes who had been selected for two or more years at Australian Schoolboy level were significantly more likely to succeed at the senior level. These results lead us to suggest that selection into the Australian Schoolboy team was not a precursor for later representative honours.

INTRODUCTION

Since the introduction of professionalism in Rugby Union in 1995 there has been a noticeable increase in the amount of scientific research that has been performed within the sport. This may be attributed to an increase in commercial and public interest as well as the financial impact professional sport plays on the lives of individuals involved (Agnew, 2006). This research has been conducted internationally investigating a range of areas from the physiological requirements of players (Cuniffe, Proctor, Baker & Davies, 2009; Duthie, Pyne & Hooper, 2003; Quarrie & Hopkins, 2007) to performance indicators for teams (Bishop & Barnes, 2013; Eaves, Hughes, & Lamb, 2005; James, Mallalieu & Jones, 2005).

Previous research has led to a more critical approach to talent identification and development. Consequently, the National Body for Rugby Union in Australia, the Australian Rugby Union (ARU) has refined its talent identification system and development program with the introduction of the “Pathway to Gold” initiative in 2009 (ARU, 2009). This initiative identifies representing the Australian Schoolboy team as the highest achievement for the junior/school aged player and recognises that selection in this team is a pathway through which future senior representative players are often discovered (Australian Rugby Union, 2013). However, from a scientific perspective there has been very little if any research conducted in Rugby Union on the success of talent identification and development systems as a predictor of player selection at senior representative levels. More knowledge in this area could assist in future talent development within Rugby Union and enhance the pathway to senior representative honours.

The pathway to successful performance

The pathway to successful performance is a dynamic and highly complex process involving the interaction of personal (physiological, psychological, cognitive and skill), environmental (training, coaching, family) and contextual (relative age effect, location, cultural) factors (Abbott et al., 2005; Baker, Horton, Robertson-Wilson & Wall, 2003; Vaeyans, Lenoir, Williams, & Philippaerts, 2008). Examining the practice history of elite athletes reveals the path often consisted of a combination of deliberate practice, unstructured play, organised games (competition) and other sports (Ericsson, Krampe & Tesch-Romer, 1993; Ford et al., 2009; Soberlak & Cote, 2003). It has also been reported that a relative age effect exists in a variety of sports (Cobley, Baker, Wattie & McKenna, 2009) including rugby union (Fernley,

2011) and soccer (Williams, 2010). This suggests that older and more physically mature junior athletes are often selected in representative teams where they may receive better coaching and additional practice opportunities, as well as compete at higher levels of competition. Age bias may be a catalyst for selection at the Schoolboy level however there may be more opportunities for later matures at the senior level as suggested by Williams (2010).

However, literature also suggests that a large number of athletes identified at the youth level do not progress to become successful elite athletes at the senior level (Bloom, 1985; Bompa, 1995; Martindale, Collins & Abraham, 2007; Vaeyens, Güllich, Warr, & Philippaerts, 2009). Schumacher, Mroz, Mueller, Schmid & Ruecker (2006) used prospective and retrospective analysis to investigate trends going both forward and backward in junior to senior elite cycling. They found that in cycling only 29.4 % of elite senior athletes had participated at the elite junior level (retrospective analysis), while prospective analysis revealed that 34% of elite junior athletes progressed to elite senior competitions later in their cycling career. The data from Schumacher et al.'s (2006) study indicates that at least 65% of elite senior athletes did not compete internationally as a junior athlete. Of the 2004 Olympians (4,455), 44% had competed internationally as juniors (16.8 ± 2.5 yrs) compared to 56% who made their international debut as senior athletes (22 ± 3.1 years) (Gullich, 2007 cited in Vaeyens et al, 2009). It has also been reported that a high number of senior elite level Portuguese athletes had no experience at the elite junior competition level in sports such as soccer, volleyball, judo and swimming (Barreiros, Côté & Fonseca, 2012; Barreiros & Fonseca, 2012). Grund & Ritzdorf's (2006) findings further highlighted this, when they revealed that only 21% of the 266 finalists at the 1999 World Youth Championships (Under 18s) qualified for senior international events (world championships or Olympic Games) in the following five years. Interestingly, Grund & Ritzdorf (2006) conclude that these results provide evidence that early detection and development (international success as a junior) did not have a detrimental effect on achieving success at the senior level.

The aim of this study was to investigate the pathway to successful performance within the Australian Rugby Union's talent development program and identify how effective the Australian Schoolboy team is as a milestone to senior representative teams beyond the "Pathway to Gold" program. The study also aimed to discover what influential factors play a

role in success and whether playing international schoolboy rugby union is a precursor to senior representative rugby union.

METHODOLOGY

Participants

This study consisted of two samples. Firstly, a prospective sample of players who were selected for the Australian Schoolboy team 1973-2008 (N=984). The sample was taken over a 25 year period up until the latest Australian Schoolboy player to earn a National senior selection. Secondly, a retrospective sample of players who debuted for the Australian National Rugby Union team at the senior level (the Wallabies) 1977-2012 (N=267). This sample worked back from 2012, the year of the most recent National senior debutant.

Procedure

Prospective information pertaining to Australian Schoolboy Rugby Union players from the year 1973 until 2008 inclusive was collected via the Australian Schools Rugby Union Archives (http://austschools.rugbynet.com.au/verve/_resources/AUSTRALIAN_SCHOOL_BOYS_LISTING_BY_YEAR.pdf). The information collected was analysed and categorised by the school, state, and the year(s) of representation of every player. Information regarding whether a player had progressed to represent at a provincial level (State and Super Rugby) or play for Australia at the senior level was retrieved from the Australian Schools Rugby Union Archives (<http://austschools.rugbynet.com.au/default.asp?id=24299>). In addition, retrospective data was obtained on the number of Australian representations from 1977 to 2012 via Morgan, (2012) and <http://www.rugby.com.au>. This information was separated into two categories; those who had previously represented the Australian Schoolboy team and those who had not.

Information regarding the percentage of pupils attending Government schools and Non-Government Schools was taken from the Australian Bureau of Statistics (<http://www.abs.gov.au> cat. no. 4221.0). This information was sourced over five year intervals from 1975 to 2010 to create an indication of the percentage of students within each category.

Statistical Analysis

A prospective analysis was conducted to investigate the likelihood of Australian Schoolboy representatives via state, location and school type (Government v's Non-Government) progressing to senior representative rugby union. A retrospective analysis then considered the number of Australian National Rugby Union representatives who had followed the player development pathway of graduating from the Australian Schoolboy team.

All data obtained were entered into SPSS version 20 for analysis. The data was checked and then illustrated prospectively and respectively by formulating descriptive statistics. Chi-square and odds ratio (with 95% confidence intervals) analysis were conducted to detect a deviation from the expected distribution of Australian Schoolboy players, by school type and by State, relative to the observed distribution. The inclusion of the odds ratio essentially provided both a secondary validity check of the χ^2 analyses across categories, and an estimation of the effect size. A Fisher's exact test was conducted to determine the associations between those players that were selected in the Australian Schoolboy team for one versus two years and who went on to represent at a senior Provincial or National level. For all analyses conducted $p < .05$ was set.

RESULTS

During the period from 1973 to 2008 a total of 984 players were selected in the Australian Schoolboy Rugby Union team. Table 1 describes a prospective analysis of these players and displays the raw number and percentage of players who continued on with their playing career to represent at Provincial (30.6%) and National level (12.7%).

Table 1:
A prospective analysis of players selected in Australian Schoolboy teams (1973-2008) to playing senior representative Rugby Union

	N	%
Total Australian Schoolboys Players	984	100
No participation in Senior Representative level	683	69.4
Represented at the Provincial level	301	30.6
Represented at National level (i.e. Wallaby Cap)	125	12.7

A subsequent retrospective analysis of the National level players is shown in Table 2. This Table illustrates that of the 267 players who made their senior National debut (i.e., Wallaby Cap) between 1977-2012, 46.1% of them played for the Australian Schoolboy team.

Table 2:
A retrospective analysis of senior Australian Rugby Union players (2012 -1977) that played in the Australian Schoolboy team

Senior Australian players who...	N	%
made their National Debut	267	100%
previously represented Australian Schoolboy team	123	46.1

The State distribution of Australian Schoolboy players and their transition to Provincial and National level is shown in Figure 1. The figure outlines that the majority of Australian Schoolboy players are from New South Wales (NSW) and that this majority continues onto Provincial and National selection.

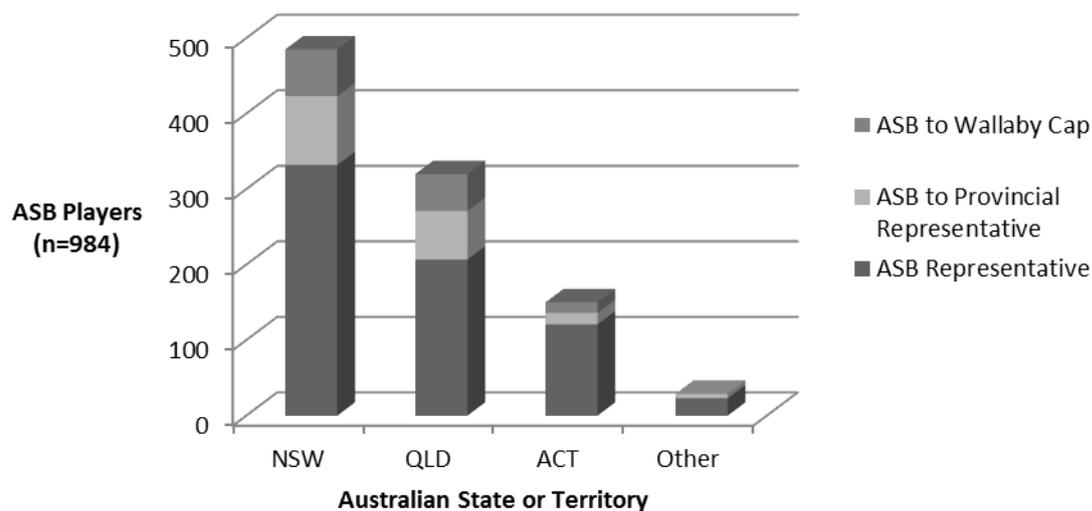


Figure 1:
The distribution and transition of Australia Schoolboy (ASB) representatives to Senior National Selection (Wallaby Cap) by State (1973 – 2008)

A follow up analyses of the observed distribution and transition of Australian Schoolboy players shown in Figure 1 when compared to the theoretical expected mean distribution of the Australian population revealed that proportionally, significantly more Australian Schoolboy players are from the Australian Capital Territory (ACT) $\chi^2(2, N=955) = 541.3, p < .001$, OR

= 0.15 (CI 0.10-0.23). Table 3 shows that this over representation is continued through to senior Provincial and National selection.

As shown in Table 4, a statistically significant difference was also found between the number of Australian Schoolboy players from Government Schools, when compared to the number of players from Non-Government schools $\chi^2(1, N = 984) = 976.38, p < .001, OR = 0.14$ (CI = 0.11-0.17), with 466 (167%) more players being selected in the Australian Schoolboy team than one could theoretically expect. Likewise, this trend also continued with Australian Schoolboy players from Non-Government Schools being significantly over represented at both senior Provincial and National levels.

The analysis of the data also revealed an extremely statistically significant difference between those players who were selected in the Australian Schoolboy team for one year and continued on to senior Provincial level 28.1% (238/847), compared to those who were selected for two years and continued on to senior Provincial level 46.0% (63/137) ($p < 0.0001$). Again this trend continued on to National selection with an extremely statistically significant difference found between those players who were selected in the Australian Schoolboy team for one year and continued on to senior National selection 10.3% (87/847), compared to those who were selected for two years and who continued on to senior National selection 27.7% (38/137) ($p < 0.0001$).

An analysis of the data between those who were selected in the Australian Schoolboy team prior to 1995 (pre professional era) and those who continued on to senior National selection 17.3% (71/441), compared to those who were selected in the Australian Schoolboy team in 1995 (and beyond) and who continued on to senior National selection 12.0% (54/448) was considered to be trending toward significance ($p < 0.068$).

Table 3:
The distribution of the transition of Australia Schoolboy (ASB) representatives to senior National Selection (Wallaby Cap) by State (1973-2008)

Category	<i>N</i>	NSW	QLD	ACT	χ^2	<i>P</i>	ω	NSW v ACT OR	QLD v ACT OR
All ASB representatives (Δ)	955	485 (-129)	320 (+8)	150 (+121)	541.3	< .001*	0.37	0.15 (0.10-0.23)*	0.19 (0.13-0.30)*
ASB to Provincial Representative (Δ)	295	153 (-36)	113 (+16)	29 (+20)	55.81	< .001*	0.29	0.25 (0.11-0.55)*	0.36 (0.16-0.80)*
ASB to Wallaby Cap (Δ)	125	62 (-18)	49 (+8)	14 (+10)	33.83	< .001*	0.34	0.22 (0.07-0.71)*	0.34 (0.10-1.12)

Table Notes: Only NSW, QLD and ACT and Included, *N* = Total number players in Category; (Δ) is the difference between the observed distribution and the theoretical expected mean distribution reported in raw numbers of the Australian Population from 1973 - 2008; χ^2 = Chi-Square, *P* = probability value, ω = power/strength of trend; OR = Odds Ratio calculation, () = 95% Confidence Interval. * = Significant finding ≤ 0.05 .

Table 4:
The distribution of the transition of Australia Schoolboy (ASB) representatives to senior National Selection (Wallaby Cap) by school type (1973-2008)

Category	<i>N</i>	Government School	Non-Government School	χ^2	<i>P</i>	ω	Govt. v Non-Govt. OR
All ASB representatives (Δ)	984	251 (-446)	733 (+446)	976.38	< .001*	1.04	0.14 (0.11-0.17)*
ASB to Provincial Reps (Δ)	301	74 (-174)	277 (+174)	419.67	< .001*	1.22	0.11(0.08-0.16)*
ASB to Wallaby Cap (Δ)	125	34 (-54)	91 (+54)	114.94	< .001*	0.98	0.16 (0.09-0.27)*

Table Notes: *N* = Total number players in Category; (Δ) is the difference between the observed distribution and the theoretical expected mean distribution reported in raw numbers of students enrolled in schools from 1975-2012; χ^2 = Chi-Square, *P* = probability value, ω = power/strength of trend; OR = Odds Ratio calculation, () = 95% Confidence Interval. * = Significant finding ≤ 0.05 .

DISCUSSION

Over the past 25 years, 277 players have made their senior National debut in Rugby Union with 46% of players coming through the traditional pathway prescribed by the Australian Rugby Union in their “Pathway to Gold” talent development program (ARU, 2009). This above finding along with other findings from our study revealed that early success as an Australian Schoolboy Rugby Union representative was not always a predictor of success as a senior rugby player. This supports evidence within previous literature (Barreiros, Côté & Fonseca, 2012; Vaeyens et al, 2009) where a large number of athletes that had played senior elite level rugby had not played nationally at the junior level.

It appears, over time, most players from the Australian Schoolboy program are surpassed by previously non-selected players identifying the inaccuracies of predicting future talent through early success (Barreiros, Côté & Fonseca, 2012). It also illustrates that factors or aspects of performance that contribute to success of athletes at 18 years of age may be quite different to what is required at the highest senior level (Reilly, Williams, & Richardson, 2008; Williams & Reilly, 2000). There may be a number of reasons why representation at the junior level does not precede success at the senior level in team sports. At the youth level in Rugby Union, physiological requirements could determine selection over key skill competencies (Carling, Gall, Reilly & Williams, 2009; Gabbett & Georgieff, 2007; Gabbett, 2000). As players move into senior representation, physiological requirements may change in Rugby Union allowing new players with different physiological attributes to be successful. Schumacher et al. (2006) suggested that a change of physiological requirements in aerobic capacity around the age of 22 is why many cyclists begin to excel later in their careers. The dominant RAE that exists in Australian Junior Rugby Union (Fernley, 2011) suggests that coaches favour slightly ‘older’ players and early maturers when selecting junior representative teams. Consequently, these players receive additional coaching, practice and competition opportunities during adolescence leading to an ‘accumulative advantage’ during their junior career (O’Connor, 2011).

However, findings from this study reveal that RAE may not be as biased towards older players as previously thought. It has been suggested that while relatively older players may have received more training and game time opportunities during the youth development period, performance is often based on physical attributes alone. Thus less time is spent improving technical and tactical skills (Williams, 2010). Then, as the players approach

adulthood the physical benefits often dissipate and the relatively older players may find themselves unable to compete successfully at a senior level, especially as the variation in the physical attributes of younger players lessens.

There may also be a percentage of Australian Schoolboy players who have discontinued engagement in Rugby Union due to injury, burn out, loss of interest, or too much pressure which may be caused by early specialisation or early success (Fraser-Thomas, Côté & Deakin, 2008; Grund and Ritzdorf, 2006; Baker, 2003). However, these findings are inconclusive and warrant further research.

Whilst there have been a number of factors discussed regarding players who do not make the step from elite junior to elite senior Rugby Union, there are interesting findings related to those who do. Firstly, there is a significant advantage to players who have been educated in Independent/ Non-Government Schools system to play both in the Australian Schoolboy team and to take the step to a senior representative team at either Provincial or National level; even though enrolments at Government Schools far outweigh those at Non-Government Schools. It is speculated that Rugby Union in Australia tends to have a higher priority within the Non-Government schooling system than in the Government School system with more regular competition available. An environment which provides access to sporting resources, regular competition, quality coaching, and socio-cultural and economic factors may provide a catalyst for enhanced youth sporting development (Gulbin, 2008).

Similarly, there is also a significant advantage of players coming through the eastern states of Australia. The results of players representing both Schoolboy and Senior level from these states reflect the breakdown of total player numbers across Australia (ARU, 2013i). Due to higher playing numbers in the eastern states, talented junior players from surrounding states may be limited in opportunities to be identified due to lack of talent identification infrastructure outside of the Eastern states. According to the Australian Rugby Union website data on the Talent Discovery Program (<http://www.rugby.com.au/tryrugby/PathwaytoGold/TalentDiscoveryProgram.aspx>) only 17.24% of the talent scouting network are based outside of New South Wales (NSW), Queensland (Qld) and the Australian Capital Territory (ACT). What is interesting is that, while NSW offers the most Australian Schoolboys representatives, players in this research from the ACT, and to a lesser extend QLD are statistically over represented in the Australian

Schoolboys team with this over-representation continuing into senior Provincial and National selection. Reasons for this are unknown, however this may be grounds for further study.

What is perhaps the most interesting result from the data generated is the percentage of players who have represented the Australian Schoolboy team for two years or more going on to represent at the National level. It has been identified that this group of players have a significantly higher chance (27.3 %) of playing for Australia at the senior level in comparison to players who have played only one year (10.3%). Therefore, multiple representatives are almost 3 times more likely to achieve National selection.

Therefore, there is the need to speculate why these players are more likely to progress than their one year counterparts. Firstly, the relative age effect does not come into consideration within their first year of representation, as the players would be younger than many of the opposing players who would be in line for selection. Therefore, this group may have been selected on skill competencies rather than physiological requirements as previously discussed (Fernley, 2011). For this reason they may have demonstrated an ability that is not dependant on physiological attributes such as size and strength. This effect could be further magnified as Australian Schoolboy representatives must be less than 18 years old to be eligible for selection.

These findings are somewhat supported by Schumacher et al. (2006) who found that cyclists who have competed at the international junior level and who regularly succeeded in terms of podium finishing places were more likely to be successful as seniors. It was suggested these athletes developed more mental skills needed to compete at the top, tactical skills and experience. It could be assumed that due to a player's success in being selected for two or more years in the Australian Schoolboy team, that this success had also developed their mental skills more than players who had only been selected for one year.

Another reason for the greater success rate of players who were selected for two years could be due to the players having physically more time within an elite youth development model as prescribed by the ARU. As Côté and Fraser-Thomas, (2008), Baker and Cobley, (2008) and Ericsson et al. (1993) discuss, the hours spent in deliberate practice show a correlation with elite performance. These may be the athletes who have received more accurate feedback, spent more time engaged in error corrected repetitive technical and tactical practice (Ericsson et al., 1993; Ericsson and Charness, 1994). Schumacher et al., (2006) also discusses

the importance that experience plays in athlete development, suggesting that experience develops mental skills and tactical knowledge. These skills often give athletes who represent at the Australian Schoolboy level for two or more years an advantage when physiological factors are comparable and therefore it could be assumed that experience may play a mental role in these players progression. According to Mills, Butt, Maynard & Harwood (2012) experience also leads to the development of resilience, attitude and emotional competence, all of which are required to excel at the top level in sport. These players may spend the longest period practicing at the top level of their field for a continued length and therefore are more likely to succeed as expert performers (Ward, Hodges, Williams and Starks, 2004).

Conclusion

After investigating the pathway to successful performance within the Australian Rugby Union's talent development program, it was discovered, through prospective analysis that from 1973-2008 less than 15% of all Australian Schoolboy players went on to represent the National Team of Australia. Retrospective data illustrated that from 1977-2012 less than 50% of all senior National representatives came from the Australian Schoolboys pathway. This illustrates that players who have aspirations of playing for Australia still have an opportunity if they miss this early stage of the pathway and should continue to work towards their goals. The findings also drew upon a number of influential factors which were noted to play a role in success for both national schoolboy and senior representative selection. Attending a Non-Government School was seen as advantageous for selection in both levels, whilst selection in the Australian Schoolboy team for two consecutive years or more was identified as a significant contributor to later success at either senior Provincial or National level in comparison with the single year representatives. Players who do not develop directly after school have the opportunity to develop in the Under 20 Premier Rugby Competition and then the Premier Rugby Competition within each state of Australia. This may be another opportunity for future selection into representative teams.

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