Performance trajectories of bowlers and batters from youth level to senior professional status in cricket

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Abstract

The identification and development of talent towards expertise is the primary goal for many professional cricket organisations. The purpose of this study was to utilise retrospective County Age Group (CAG; U10–U19) match performance data to develop age-specific benchmarks for young cricketers to achieve senior professional status. Moreover, results were aligned to the Development Model of Sport Participation (Côté et al., 2007) to better understand the developmental trajectories of bowlers and batters. The study consisted of 251 male players from an English professional first-class county cricket club who were categorised into two skill-sets dependant on their match performance data (bowlers: n=118; batters: n=133). Bowling and batting averages, as well as wickets taken and runs scored, were used for analysis. No significant differences were identified for bowlers who were successful and unsuccessful in achieving professional status prior to U17. In contrast, batters who achieved professional status displayed significantly superior match performance data throughout the pathway. Overall, this data: (a) provides evidence of performance targets for young aspiring cricketers to achieve expertise in English cricket, (b) highlights that bowlers and batters typically follow different development trajectories, and (c) offers an analytical tool for key stakeholders to develop an evidence-based talent identification programme.

Keywords: Talent identification; talent development; benchmarks; early specialisation; early sampling; DMSP

Introduction

Developmental pathways are mapped by cricket organisations to prepare young players for the demands of professional competition at adulthood (English, Nash, & Martindale, 2018). However, an increasing amount of literature demonstrates that selection into talent development programmes is not objectively clear and often relies heavily on key stakeholders' (e.g., coaches, practitioners, scouts) perceptions of a player's potential (see Lascu, Spratford, Pyne, & Etxebarria, 2020 for a review). Despite the use of performance analysis protocols becoming popular amongst cricket organisations (e.g., Lemmer, Bhattacharjee, & Saikia, 2014), there is little evidence-based practice that utilises these systems as part of a cricket-specific talent identification and development process (Barney, 2015). Thus, it is plausible to suggest that the existing procedures could lead to subjective bias in both the initial identification and subsequent development of young cricketers. These selection biases are often subconscious but can affect the judgement of talent in numerous ways and even those considered "experts" in their fields are likely to exhibit them (see Johnston & Baker, 2020 for a review). As such, relying too heavily on the opinions of coaches in trying to gauge future talent is likely to result in errors and talented players missing out on selection.

One possible method of improving the effectiveness and efficiency of selection onto talent development programmes is through utilising performance analysis data within a talent development pathway to create age-related benchmarks of performance. Indeed, this approach has been previously adopted in sports such as football (Kelly, Williams, Jackson, & Wilson, 2020), swimming (Allen et al., 2014), and track and field (Boccia, Moisè, Franceschi, Trova, Panero, Torre, & Cardinale, 2017).These benchmarks could systematically identify those with the *potential* to progress to professional status, allowing for key stakeholders to distribute funding and resources more accordingly (Allen et al., 2014). Furthermore, structuring talent identification programmes in relation to such benchmarks could determine the crucial years of

youth development, as well as to distinguish trends in age-relative performances. As such, key stakeholders could utilise age-relative performance trends whilst drawing upon youth development frameworks, such as the Developmental Model of Sport Participation (DMSP; Côté, 1999; Côté, Baker, & Abernethy, 2007), to aid in the formation of an evidence-based talent identification and development process in high-performance youth cricket.

The DMSP offers two converging developmental trajectories towards expertise: (a) *early sampling* and later specialisation, and (b) *early specialisation* (Côté et al., 2007). First, attaining expertise through *early sampling* begins with young athletes participating in a variety of sports and activities that focus primarily on enjoyment. During this "sampling phase" (typically between the ages of 6 to 12 years), athletes place a higher emphasis on deliberate play (i.e., "loosely structured activities that involve minimal adult presence and are aimed at increasing intrinsic motivation and enjoyment"; Strachan, Côté, & Deakin, 2009, p. 78) (Côté, 1999; Fransen, et al., 2012). Young athletes then transition to the "specialising phase" (typically between the ages of 13 to 15 years), whereby they direct their attention towards the development of one or two sports and place a greater emphasis on enhancing sport-specific skills (Strachan, Côté, & Deakin, 2009). Finally, young athletes' transition to the "investment phase" (typically aged +15 years), where their time is dedicated to achieving excellence in their chosen sport. This requires a significant investment in deliberate practice, which can be defined as sport-specific, coach-led training (Ericsson, Krampe, & Tesch-Römer, 1993), with the purpose of enhancing performance capabilities (Fansen, 2012; Strachan et al., 2009). Conversely, attaining expertise through *early specialisation* suggests that young athletes do not participate in the sampling phase. Instead, they begin their journey in the specialising phase where they accumulate hours of deliberate practice throughout their entire youth development (Côté et al., 2007).

Irrespective of the DMSP, many developmental programmes in cricket have established systems that encourage *earlier age-specialisation*. As an example, the current selection process into county cricket talent pathways in England, highlight that selection often takes place as young as aged 9 years (ECB, 2018). This approach has been widely associated with significant pitfalls. Specifically, questions remain over the lack of evidence to accurately predict future performance capabilities at adulthood based on early selection and performance (Till & Baker, 2020). Moreover, biases during recruitment into talent pathways (e.g., birthplace effects, maturation bias, relative age effects; Lascu et al., 2020) and possible drawbacks of engaging in specialised environments (e.g., burnout, injury, overtraining; Bergeron et al., 2015) have also been associated with selection at young ages. Specifically within cricket, current literature utilising the DMSP raises further questions over the existing talent development structures, as both bowling (e.g., Ranson King, Burnett, Worthington, & Shine, 2009; Philips Davids, Renshaw, & Portus, 2010) and batting (e.g., Jones, Lew-Hardy, Kuncheva, Brandon, Bobat, & Thorpe 2020; Weissensteiner, Abernethy, Farrow, & Müller 2008) have been identified as late developing skills-sets. For instance, Philips et al. (2010) highlighted that a significant number of international fast bowlers in their sample did not specialise in cricket until their late teens. Similarly, both Jones et al. (2020) and Ford et al. (2010) identified that superior batters within their samples participated in a higher volume of batting-specific activity after the early sampling phase (i.e., U13 to U16). Further, Weissensteiner et al. (2008) revealed that there was no evidence of advanced perceptual-cognitive skills within their younger cohort (i.e., U15), which several studies have identified as correlating with achieving expertise in batting (e.g., Mann, Spratford, & Abernethy, 2013; Müller et al., 2010). Collectively, these results suggest that early specialisation is not associated with achieving expertise in both bowling and batting.

It is important to note that this previous research has applied qualitative data collection methods, which could be limited by a participants' ability to accurately recall their age-specific

developmental activities (Jones et al., 2020). Therefore, to complement such investigations, a thorough quantitative analysis of age-specific match performance data could provide a more comprehensive consensus into age-specific talent development research in cricket. Further, aiming to generate statistical data to objectively inform talent selection will likely mitigate the subjective biases outlined by Johnston and Baker (2020).

Before undertaking such a quantitative analysis, it is important to understand the relationship between cricket match performance data and an individual player's relative success. Bowling and batting averages can be used as such markers of success in match-play within cricket, since they reflect an individual's performance and are largely independent of the team's performance (Ahmed, Jindal, & Deb, 2011). Bowling averages refer to the number of runs a bowler concedes before taking a wicket; therefore, a lower bowling average would indicate a more effective bowler. Batting averages refer to the amount of runs a batter scores before getting out; thus, a batter with a higher batting average is typically regarded as a superior player. Considering this, it is possible that match performance data can be used to gauge an understanding of an individual's current ability. However, the extent to which such data is used to assess a player's future potential is unknown. Therefore, the aim of the study was to compare the (bi)annual-age group (i.e., U10 toU19) match performance data of bowlers and batters from three attainment groups from a first-class county cricket club, to investigate any attainment group differences along the talent pathway: (a) Professional, (b) Academy, and (c) County Age Group (CAG). A secondary aim of the study was to identify the typical trajectories taken by both bowlers and batters who achieved professional status and subsequently create age-relative performance benchmarks.

Methods

Sample

This study retrospectively traced the journeys of 251 male (bi)annual-age group (U10–U19) cricketers. Players were included in this study if they had been selected to represent an English professional first-class counties cricket club at CAG level and had reached their tenth birthday between the years of 2004 to 2012. CAG cricket is the highest standard of non-paid organised cricket a player can achieve at youth level in England, prior to regional and/or national youth selection. The justification for the 2004 to 2012 cut-off dates was due to 2004 being the initial time that the website "play cricket" was used to reliably archive players match data. Further, due to current employment law and ECB/PCA guidelines, counties must make a decision to sign a player or not post aged 18 years (PCA, 2019). If a player is not signed, they can no longer represent the county without being paid the equivalent of minimum wage set out by the PCA. Therefore, all players included in this sample had finished their journey through the CAG programme and have either signed a professional contract or been released. As such, these dates capture the full data-set of players' available. Ethical approval for this study was granted by the Health, Education, and Life SciencesFaculty Academic Ethics Committee at Birmingham City University.

Measures

In accordance with Ahmed et al. (2011), this study used players' bowling and batting averages as indicators of performance at each (bi)annual-age group. Additionally, players' total runs and wickets per year were collected to add context to their batting and bowling averages. Bowlers' match analysis data was considered for this study if it met the following criteria: (a) they had taken more than three wickets over the course of a season, and (b) they had bowled in 75% of the games they had played. Batters' match analysis data was considered for this study if it met the following criteria: (a) they had played more than three innings, (b) during 75% or more of

their innings their batting position was in the top six, and (c) their batting average was lower than their top score.

Procedure

The typical talent pathway implemented in county cricket in England consists of several CAG teams, usually ranging from U10 to U17 (ECB, 2018), with some counties also offering an U19 side. Within these CAGs, a select few of the highest potential players are often selected for the Academy programme, whereby they partake in additional training sessions and are offered substantially more developmental support. It is worth noting that not every age group is represented within an Academy, as players are not typically selected for such a programme until post aged 14 years. Generally, professional county clubs will look to their Academy when seeking to identify youth players to join the senior squad and sign professional contracts.

Players' average match performance data for each (bi)annual-age group that they played for the first-class counties CAG was extracted from the public website *Play Cricket*, under their Warwickshire Cricket Board section (Warwickshire County Cricket Club, 2020). Participants were allocated into two skill-set categories dependant on which criteria their performance data met: (a) bowlers (n=118), and (b) batters (n=133). Players' data was coded at eight time points along the talent pathway in accordance with its relevant (bi)annual-age group (i.e., U10, U11, U12, U13, U14, U15, U17, and U19). Following this, players were sorted into three attainment groups: (a) Professional (n=20), (b) Academy (n=46), and (c) CAG (n=185). Professional players were defined as players who had received a professional contract of a minimum of one year at any English first-class county cricket club. Academy players were defined as players who were selected for academy honours but failed to obtain a professional contract. CAG players were defined as players who had represented the first-class county cricket club at CAG level but did not progress to academy honours or receive a

professional contract. Subsequently, comparisons between Professional, Academy, and CAG attainment groups were conducted for bowlers and batters across all age groups.

Data Analysis

One-way ANOVA tests were used to compare the three attainment groups' (i.e., Professional, Academy, and CAG) performance data (i.e., bowling and batting averages, average number of wickets taken and number of runs scored) at each (bi)annual-age group (i.e., U10–U19) within their respective skill-set category (i.e., bowlers and batters). All statistical analysis was conducted using IBM SPSS statistics version 24. Results were considered statistically significant at $P < 0.05$. All results were reported as a mean unless specified otherwise.

Results

Bowlers

Firstly, no significant differences were found between the three bowling attainment groups based on mean bowling averages from the U10 to the U15 age groups (see Figure 1 and Table 1). However, significant differences in bowling averages were observed within the U17 and U19 age groups, whereby the Academy attainment group produced a lower bowling average than both the Professional and CAG attainment groups.

Figure 1 Near Here

Table 1 Near Here

Secondly, no significant differences were found between the three bowling attainment groups based on mean wickets taken across the following age groups (see Figure 2 & Table 2): (a) U10; (b) U11; (c) U12; (d) U14; and, (e) U15. However, within the U13 age group, the Professional attainment group displayed significantly more wickets taken than both the Academy and CAG attainment groups. Moreover, within the U17 and U19 age groups, the Academy attainment group displayed significantly more wickets taken than both the Professional and CAG attainment groups: (a) U17; and, (b) U19

Figure 2 Near Here

Table 2 Near Here

Batters

Firstly, the Professional attainment group displayed significantly higher mean batting averages compared to the Academy and CAG attainment groups across all age groups (with the exception of the U12 age group). Moreover, the Academy attainment group demonstrated superior mean batting averages compared to the CAG attainment group across all age groups (see Figure 3 & Table 3): However, within the U12 age group, the Academy attainment group displayed a significantly higher mean batting average compared to the Professional and CAG attainment groups.

Figure 3 Near Here

Table 3 Near Here

Secondly, the Professional attainment group scored significantly more runs than both the Academy and CAG attainment groups across all age groups (with the exception of the U12 age group). Moreover, the Academy attainment group displayed more runs scored compared to the CAG attainment group across all age groups (see Figure 4 & Table 4): However, within the U12 age group, the Academy attainment group scored significantly more runs compared to the Professional and CAG attainment groups.

Figure 4 Near Here

Table 4 Near Here

Discussion

This study quantitatively analysed the match performance data of (bi)annual-age group cricketers across three attainment groups from a first-class county cricket club to investigate any attainment group differences along the talent pathway. The secondary aim of this study

was to identify the typical trajectories taken by those bowlers and batters who achieved professional status and subsequently create age-relative performance benchmarks. Results suggest that bowlers' match performances could not differentiate attainment groups until the U17 age group, whereby those who achieved professional and academy status significantly outperformed their CAG peers from this age group. These results indicate that the ability to identify or differentiate bowlers for selection towards professional or academy status prior to U17 years of age may prove difficult. Contrastingly, batters who achieved professional status scored significantly more runs at a higher batting average throughout the talent pathway, with the exception of the U12 age group, whereby the Academy cohort outperformed both the Professional and CAG attainment groups. As such, it could be argued that match performance data can be used as an indicator of a batter's success across the talent pathway. Therefore, the findings of the current study could be utilised as normative data for coaches and players, whilst recognising that differences between relative age group performances are evident for batters from U10 but not for bowlers until U17.

First, although there are no significant differences in bowling performance data prior to U17, the current findings demonstrate that the Academy attainment group achieved superior match performance data compared to both the Professional and CAG cohorts within the U17 and U19 bi-annual-age groups. As such, it is possible to suggest that the selection of bowlers who achieved professional status is not solely determined by a players' match performance data. This corroborates with existing research which suggests that sport selections are often decided via an experts' subjective view of a player's potential as opposed to them being objectively informed (e.g., Ahmed, et al., 2011; Patel, Bracewell, Gazley, & Bracewell, 2017; Williams, & Reilly, 2000). Further, these results somewhat counterintuitively suggest that such views are not influenced by bowlers' match performance data. Based on this evidence, further research is required to critically analyse the effectiveness of expert opinion (i.e., the "coach's

eye") upon selection of bowlers to professional status. Consequently, the need for (and subsequent impact of) objective tools in facilitating the selection of professional bowlers can be evaluated in order to improve efficiency in talent selection and mitigate the effects of subjective biases.

It is important to acknowledge that the results of this current study do not differentiate between seam and spin bowlers or provide any additional variables to identify the causes of these findings. However, these findings may be explained through previous studies. For example, the absence of distinguishable differences in bowlers' performance data prior to U17 supports Pyne et al. (2006), who highlighted that "early-maturing bowlers may possess a performance advantage over their late-maturing counterparts, but this difference is likely to dissipate as a player reaches the end of the junior phase of their cricket career" (p. 625). Thus, it could be argued that selection into talent development programmes for seam bowling should be postponed until post-maturation, since maturation discrepancies are most likely to occur pre and during peak height velocity (Much & Grondin, 2001). Such a concept corroborates with the criticism that traditional talent identification programmes place too much emphasis on the early identification of talent and for failing to consider variations in maturation rates of developing players (Abbott, Button, Pepping, & Collins, 2005). Specifically in cricket, studies regarding the anthropological characteristics associated with fast bowling success have consistently identified that bowlers of larger physical stature, longer limbs, and greater strength generally exert higher ball velocity (e.g., Pyne, et al., 2006; Singh & Singh, 2015; Stuelcken, Pyne, & Sinclair, 2007). Furthermore, Pyne et al. (2006) identified that body mass and percentage of muscle mass could be used as predictors of ball velocity in youth but not in senior level bowlers. As such, differentiating between relative match performances prior to peak height velocity could prove both challenging and biased. However, as the current results do not

investigate the anthropometrical or maturation status of its participants, further research is required to substantiate these suggestions.

The DMSP model provides potential further insight as to the lack of significant differences in early age (i.e., prior U17) bowling performances. For instance, placing an emphasis on obtaining superior bowling match performance data from an early age could require bowlers to follows an *early specialisation* trajectory. Interestingly, this approach has been linked to reduced motor skill development (Mostafavifar, Best, & Myer, 2013). Mostafavifar et al. (2013) explain that young players who follow an *early specialised* trajectory dedicate their time to the development of the motor skills most prominent within their selected sports and subsequently overlook the motor skills they could ascertain through following a diversified participation programme. For instance, Read, Oliver, De Ste Croix, Myer, and Lloyd (2016) identified that within youth soccer, high volumes of repetitive activities from a young age, such as kicking, could result in muscular skeletal adaptations. Additionally, Feeley, Agel, and LaPrade, (2016) identified that there are other tangible risks associated with the *early specialisation* trajectory, which include overuse injuries, hindered musculoskeletal development, and burnout. Interestingly, McGrath and Finch (1996) provided evidence that fast bowlers often suffer from such injuries; the most serious of which being the development of irregular radiological characteristics, such as stress fractures in the lumbar spine. As such, it could be suggested that those bowlers who follow an *early specialisation* trajectory may be at greater risk of developing overuse injuries, which could hinder their development to professional status; especially as these injuries are most likely to occur during the adolescent growth spurt (Niemeyer, Weinberg, Schmitt, Kreuz, Ewerbeck, & Kasten, 2006).

With regards to the batting skill-set, results identified that batters who achieved professional status displayed significantly higher levels of match performance data (i.e., batting average and runs scored) compared to those within the academy and CAG cohorts (with the

exception of the U12 age group). More specifically, batters who achieved professional status increased their batting average by 41% from U15 to U19, whereas those in the Academy attainment group displayed a relative decrease of 5% over the same time-period. These results highlight how greater batting performances in age-specific match data throughout the talent development pathway is associated with professional status. As such, the current results could provide age-relevant performance benchmarks for batting, which could be utilised for coaches to transition towards employing an evidence-based approach to talent selection. For instance, coaches may be able to compare a player's performance data with those outlined within this study to contextualise batters' performances. This would provide a more informed indication of an individual's potential, through comparisons with previous statistical data which corroborates with achieving professional status. Additionally, the implication of a more objective approach to talent selection could mitigate the reported effects of selection biases present in traditional subjective systems (Johnston & Baker, 2020) and lead to much fairer and more efficient talent development programmes.

The results of the present study contradict that of previous research which suggest that key development stages for batters occur predominantly throughout adolescence (e.g., Jones et al., 2020). Instead, this study has identified that performances from as early as U10 corroborate with achieving professional status. As such, it could be argued that through early specialisation, batters are more likely to experience early success and benefit from continual selection onto the talent pathway. Such benefits potentially include an increase in exposure to the type of training and coaching required to achieve expertise from U13 to U16 (Ford et al., 2010; Jones et al., 2020). Further, to the authors knowledge, there is no evidence to suggest that batters are at risk of developing overuse injuries through early specialisation. As such, it could be argued that exposure to additional training from a younger age may benefit a batter's ability to achieve expertise.

Limitations and Future Directions

The authors acknowledge that the results of the present study do not include details regarding players' participation history (i.e., hours trained, type of practice, and number of sports participated in), thus evaluating performance trajectories will be limited. Nevertheless, the results were sufficient to draw comparisons between talent pathway performances and align with the DMSP trajectories towards expertise. Additionally, whilst this study analysed the match performance data of over 250 participants, all those participants were taken from one of the eighteen first-class counties clubs in England and Wales. As a result, it could be argued that different talent development programmes implemented across the country might not produce similar trajectories. As such, future research is encouraged to explore the broader talent development pathway in cricket to better understand the implications of demographics, as well as being able to draw greater externally valid conclusions. Further, we recognise that there are other metrics which could be utilised when assessing players match performance data (e.g., strike rates). However, the sample of games which collected such data was severally limited, especially in pre-U17. As such, the measures used in this study were deemed by the authors to be the most accurate available depiction of player performances throughout the talent pathway.

As the results of the current study identified no significant differences to in match performance data for bowlers across the attainment groups prior to U17, it is recommended that coaches and practitioners should become aware of a young bowler's growth and maturation status throughout their development; particularly before judging their bowling performance and future potential. Future research should aim to identify additional markers for potential expertise in young bowlers, which do not rely solely on anthropological differentiators, (e.g., psychological characteristics such as high levels of motivation, competitiveness, mental strength, and focus; Phillips et al., 2010) and explore how they can be objectively measured, to develop more holistic evidenced-based talent identification programmes for bowlers in youth

cricket. Finally, due to the format of the data source, there is no way of differentiating between seam and spin bowlers. As previous research has highlighted, seamers and spinners potentially follow contrasting developmental trajectories (e.g., Jones et al., 2019). As such, future research should investigate any disparities between match performance data for selected Professional, Academy, and CAG seamers and spinners.

Conclusion

This study has outlined a data driven approach to aid talent identification for elite youth cricketers. Results revealed differences in the stages at which bowlers and batters' match performance data corroborates with achieving professional status. For instance, bowlers who achieved academy and/or professional status did not produce significantly superior match performance data until post aged 17 years. Therefore, an argument could be made that coaches should not take into consideration bowlers' performance data in their talent identification decisions until post-aged 16 years, which aligns with the literature discussed around growth, maturation, and developmental trajectories of bowlers (e.g., Phillips et al., 2010; Ranson et al., 2009). In contrast, batters' performance data was associated with achieving professional status from as early as U10. Therefore, it is plausible to suggest that specialising early may facilitate long-term development in batting. As such, future research is recommended to investigate the developmental trajectories of batters and how match performance data influences selection processes. In its current form, the results from the present study can be used as performance benchmarks to aid coaches in employing an evidenced-based guide to talent selection for batters, which could contribute towards mitigating the subjective biases outlined by Johnston and Baker (2020). Finally, further research is warranted to investigate players' participation history (i.e., number of hours trained, number of sports played, training loads) to provide greater insight as to the causal effects that explain these mechanisms.

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