Talent development – Early specialization and critical periods in acquiring expertise: A comparison of Traditional vs. Detection Talent Identification in Team GB Cycling at London 2012

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Abstract

The aim of this study was to compare two methodologies employed by the British Cycling talent identification programme. Specifically, we investigated cyclists selected to represent GB cycling team at the London 2012 Olympics using (a) a traditional talent identification methodology (British Cycling Olympic Development Programme), where selection is based upon race results and (b) a detection talent identification methodology (UK Sport Talent Team Programme), which is a multi-Olympic event initiative that identifies athletic potential from a range of generic, physical and skill-based tests. To facilitate this comparison, we calculated the speed with which expertise was acquired. A Mann-Whitney U test (U =16.0, p = 0.031) indicated that the speed of acquiring expertise was quicker in detection talent identification (*Mdn.* = 5.4) than traditional talent identification (*Mdn.* = 7.2). Practice started later with detection talent identification than with traditional talent identification (14.12 years vs. 11.23 years, respectively), which affected the period to excellence. Thus, detection talent identification resulted in an absence of early specialization, which suggests a critical period for attaining cycling expertise. We hypothesize a genetic basis of talent and propose that a detection talent identification programme provides a better starting point of deliberate practice, traditionally a weakness in calculating the period to excellence.

Keywords: early specialization, critical period, deliberate practice, period to excellence, talent.

Introduction

Talent identification attempts to identify factors that collectively predict an individual's future performance potential, selecting the best candidates for advanced training. Since the late 1990s, British cycling received funding through the UK National Lottery and commercial sponsorship from British Sky Broadcasting Group Plc. Both funding and focused talent identification measures have contributed to a considerable increase in Olympic medal success in cycling for the UK: Sydney 2000 (4 medals), Athens 2004 (4 medals), Beijing 2008 (14 medals), London 2012 (12 medals and Rio 2016 (12 medals). However, there is little available empirical data directly comparing the merits of the different talent identification processes utilized. We focus on two methods used for talent identification in British Cycling, *traditional* and *detection*, which afforded the opportunity of directly comparing the outcomes for individuals selected based on either of these two different approaches.

Traditional talent identification methods consist of selecting athletes who are currently involved in their chosen sport (Lidor, Côté, & Hackfort, 2009) by using achievement measures (e.g., race results, rankings, etc.), expert assessment of performance by coaches and talent scouts within that sport. Thus, motor performance is a key factor in selection and comparative levels of initial motor learning have been achieved through interaction with the task. In sports, the traditional talent identification methodology is the predominant pathway for identifying potential, and 80% of elite performers were selected using this approach in 12 major sports (English Sports Council, 1998)**.**

An alternate approach is talent identification by detection, which measures components of successful performance (e.g., power, anaerobic capacity, etc.). It is possible to apply this approach to those with no history in the defined sport (Williams & Reilly, 2000) and those displaying embryonic abilities with little task knowledge.

This approach thus potentially widens the available pool of performers to any participant willing to attend testing. Furthermore, the generic tests do not require expert facilities and can occur in schools, halls and clubs. Therefore, this provides the potential to identify talented athletes with no prior experience and experienced late developers.

British Cycling talent development pathway, the "Rider Route", utilizes these two talent identification methodologies and provides suitable data that facilitates the comparison of traditional and detection talent identification. The traditional route consists of competitive opportunities resulting in cyclists positioning themselves in the British Cycling Rider Route talent development pathway, which consists of regional and national development centers; placement depends upon maturity and experience. Selection occurs from the age of five (British Cycling, 2020), and competitive results determine progression into the Olympic Development Programme based on race results performance. The detection route is the Talent Team Programme, a multi-Olympic event initiative by UK Sport and coordinated by each governing body (in this case, British Cycling) that identifies athletic potential from a range of generic physical and skill-based tests. Identification occurs by testing candidates between the ages of 11 to 16 years in schools or performance centers. Testing ethics stipulates that the age of 11 years is the earliest testing age (British Cycling, 2020). The selection consists of physiological performance on a Wattbike (turbo trainer), with measures such as power output and peak cadence assessed. Upon selection, cyclists join the Rider Route in preparation for membership of the Great Britain Cycling Team. Apart from age and experience-related differences, the process of motor development for both groups follows a similar path (British Cycling, 2020).

The two different selection processes mirror, in part, the theoretical debate in which researchers focus on the importance of practice (Ericsson, Krampe, & Tesch-

Römer, 1993; Ericsson, Prietula, & Cokely, 2007; Helsen, Starkes, & Hodges, 1998; Helsen, Hodges, Van Winckel, & Starkes, 2000; Law, Côté, & Ericsson, 2007) or talent (Hambrick, Burgoyne, Macnamara, & Ullén, 2018; Lombardo & Deaner, 2014; Staff, Gobet, & Parton, 2020) in achieving expertise. Those researchers who emphasize the importance of practice largely deemphasize the role of talent. Ericsson et al. (1993) stated that, for children, early practice is significant and must coincide with biological and cognitive development. Furthermore, early specialization is relevant in children, as later starters would not be able to "catch up" (Ericsson et al., 2007). However, there is still a considerable debate as to the impact of early practice to expertise (Baker, Joseph, Cobley, & Fraser-Thomas, 2009; Crisp, 2019; DiFiori et al., 2017; Yustres et al., 2019) and negative outcomes have been reported, including its potential to reduce overall motor skill development (Myer et al., 2016) and its influence in facilitating burnout and injury (Malina, 2010).

By contrast, researchers who argue for a contribution from innate talent in acquiring expertise highlight the importance of critical periods (Chassy & Gobet, 2010; Tucker & Collins, 2012), which are hypothesized to rely upon genetic programming (Viru et al., 1999). Such talents result in accelerating expertise (Lombardo & Deaner, 2014) and providing an opportunity for early diversification (Staff et al., 2020) that can lead to a growth in motor development (Myer et al., 2016).

Researchers investigating elite performers have focused on developmental history and talent identification programmes for an explanation of individual differences (Ford & Williams, 2012; Güllich & Emrich, 2014; Güllich, 2014; Güllich, 2017), although direct comparisons between elite performers having followed these two routes have been infrequent (Barth, Emrich, & Güllich, 2019). To compare both selection methods, we utilized methodologies developed to assess the Deliberate Practice hypothesis (Ericsson et al., 1993) and in particular applied its definition of the start of practice and the attainment of expertise. This enabled us to calculate a chronological measure for expert achievement. We termed this the "period to excellence", which consisted of practice and recovery periods associated with developmental expertise (Bompa & Carrera, 2005; Gibala, MacDougall, Tarnopolsky, Stauber, & Elorriaga, 1995). These recovery periods are important in reducing overtraining and injury as well as allowing other life activities (Grandou, Wallace, Impellizzeri, Allen, & Coutts, 2020) and do not include practice that mitigate burnout (Lopes & Vallerand, 2020).

To quantify the effectiveness of these talent identification methods in selecting potential elite performers, we compared how quickly cyclists acquired expertise (elite proficiency), operationalized as their period to excellence. We anticipated that a natural talent selection process, which focused on the specific task demands, would lend itself to the quicker acquisition of expertise. Our hypothesis is that those individuals selected by detection talent identification would develop faster than those selected using traditional talent identification.

Method

Participants

The study includes data on all 27 cyclists (12 women and 15 men) selected for Team GB in the London 2012 Olympics. Cyclists were aged 17 to 34 years (Men: M = 20.36, SD = 1.23; Women: M = 21.23, SD = 4.62) when they achieved expertise. The starting point of deliberate practice ranged from 5.00 to 27.02 years of age. The cyclists were divided into two talent identification groups: detection talent identification (n = 9) and traditional talent identification (n = 18). A comparison of medals awarded shows that athletes selected by detection talent identification gained three individual medals and five team medals and that athletes selected by traditional talent identification gained five individual medals and five team medals.

Data Collection

We identified all Team GB cyclists selected for the London 2012 Olympics and collected their date of birth as well as the starting and finishing points of deliberate practice. The following sources were used. First, the British Cycling (n.d.) website contained riders' biographies and provided many basic data points such as age and cycling history. Second, public domain biographical information was obtained from Internet sources, local newspaper reports, cycling magazines and social media, with particular focus on the cyclists' initiation of deliberate practice. Finally, the British cycling website provided a list of athletes' agents and representatives, who were contacted with the following questions regarding the athlete they represented: (a) When did you start to focus on your sport? (b) At what age were you first coached for your sport? and (c) Did you train at any other sport prior to you focusing on your main sport? If yes, which sport(s)?

Measures

We utilized the parameters used by the deliberate practice framework (Ericsson et al., 1993) to calculate cyclists' period to excellence, which was defined as the difference between the starting point of formal training (defined as joining a club and/or obtaining regular coaching) and the first selection in a senior international competition (either the Commonwealth games, European championships, World Cup or the Olympic games).

To estimate when cyclists first joined the British cycling talent identification programme, we used the publicly available information on the British cycling website and/or athletes' personal websites. Cyclists' talent identification selections were divided into traditional and detection. Traditional talent identification cyclists were selected based on competitive results and were placed in the Riders Route at a stage that was consummate with their performance and experience. Detection talent identification cyclists were selected based on threshold measures, usually through testing days in the school environment; these athletes had no formal competitive experience. Upon selection, they entered the Olympic talent team programme, the initial stage of the Riders Route.

Results

Tables 1, 2 and 3 show the means for traditional and detection talent identification. Table 1 displays the results for the period to excellence, Table 2 for starting age, and Table 3 for expertise age.

Table 1. Period to excellence for traditional and detection methods

	Period to excellence				
Talent identification method	N	Mean	SD	Minimum	Maximum
Traditional	18	9.94	5.55	5.00	27.02
Detection	9	5.79	2.32	3.24	9.86

Table 2. Starting age for traditional and detection methods

	Starting age				
Talent identification method	N	Mean	SD	Minimum	Maximum
Traditional	18	11.23	5.55	5.00	27.02
Detection	9	14.12	1.45	11.01	16.01

Table 3. Expertise age for traditional and detection methods

	Expertise age				
Talent identification method	N	Mean	SD	Minimum	Maximum
Traditional	18	21.17	3.75	16.71	33.70
Detection	9	19.91	1.24	18.25	22.87

Period to Excellence as a function of Starting Age

A linear regression was computed with starting age as predictor and period to excellence as criterion variable. The regression equation was: period to excellence =

15.250 – (.549 × starting age); $p < .001$; adjusted $r^2 = .541$. Thus, each additional starting year *reduced* period of excellent by about half a year. After removing two athletes who started after 20 years of age (20 years and 27 years, respectively), the equation becomes: period to excellence = 19.250 – (.937 × starting age); $p < .001$; adjusted $r^2 = .821$. The later start resulted in faster expertise and each additional starting year now reduces period of excellent by nearly one entire year. Inserting the relevant mean starting age (respectively, 11.23 years and 14.12 years) in the regression equation yields a predicted period to excellence of 8.73 years for traditional talent identification and 6.02 years for detection talent identification.

Starting and Expertise Age as a function of talent identification pathway

Shapiro-Wilk test of normality indicated that the data violated the assumptions of normality: Period to excellence, W = 0.926, $p = 0.054$; Start Age, $W = 0.854$, $p < 0.001$; End Age, $W = 0.739$, $p < .001$. A Mann-Whitney U test was conducted to compare the starting age and expertise age for detection ($n = 9$) and traditional talent ($n = 18$) identification selection processes. Results indicated that there was a significant difference for starting age ($U = 37.0$, $p = 0.025$) between detection talent identification (*Mdn.* = 14.01) and traditional talent identification (*Mdn.* = 10.51) but there was no statistically significant difference with respect to expertise age ($p = 0.348$).

Period to Excellence as a function of talent identification pathway

We hypothesized that the speed of expertise achieved in British Cycling talent identification was quicker with detection when compared with traditional methods. To attain an equitable comparison of the different talent identification methodologies, we removed all data from the traditional talent identification group with a starting age of less than eleven, which is the minimum age that athletes enter the training programme based on talent identification. A Mann-Whitney U test indicated that the period to excellence was quicker in detection talent identification (*Mdn.* = 5.4, $n = 9$) than traditional talent identification (*Mdn.* = 7.2, $n = 9$), U =16.0, $p = 0.031$.

All nine cyclists (100%) selected using detection talent identification and ten traditional talent identification cyclists (56%) reached elite level in under 10-years. A single sample t-test was conducted to determine if there was a statistically significant overall difference between the observed period to excellence and the ten-year period of deliberate practice predicted by Ericsson et al. (1993) . The period to excellence for the entire sample (M = 8.55 years, SD = 3.50 years) was statistically significantly lower than 10 years, t (26) = -2.15, p = .041.

Discussion

This paper tested the hypothesis that the time required to become an expert cyclist varies depending on the type of talent identification methodology (traditional or detection) used for the initial selection. We used data from the cyclists representing Team GB in Cycling at London 2012 Olympics selected by the British Cycling talent identification programme. We predicted that those cyclists selected by the detection talent identification route would develop to expertise quicker (shorter period to excellence) than those chosen using the traditional talent identification route.

The results show that the median period to excellence of British Cyclists representing Team GB at London 2012 was significantly quicker when selection was made by detection talent identification (*Mdn*. = 5.4 yrs.) than traditional talent identification (*Mdn*. = 7.2 yrs.). This result indicates that the introduction of detection measures in the Talent Team Programme by UK Sport has resulted in Cyclists acquiring elite expertise faster than traditional talent identification methods. We therefore postulate that faster motor learning and development may be a consequence of attendant talent and an interaction with starting age, individual differences and talent identification methodology. This result is inconsistent with previous claims that the journey to expertise is 10 years (Ericsson et al., 1993) and concurs with previous sport research such as sprinting plus track and field (Lombardo & Deaner, 2014; Staff et al., 2020) indicating that the average mean period to excellence was less than 10 years, which suggests that talent contributes to performance.

Starting Age

When comparing talent identification methodologies in cycling using the period to excellence measures, the difference between detection talent identification (M = 5.79 yrs., n = 9) and traditional talent identification (M = 9.94 yrs., n = 18) resulted in a 4.15-years acceleration of expertise. The 4.15-years acceleration in the speed of expertise for detection talent identification is calculated by a later starting age and the faster motor development period. The later starting age accounted for 2.89 years = (14.12 – 11.23) (see Table 2). These results question the necessity of early practice in acquiring expertise, which for becoming an Olympic medalist has been claimed to be significant (Ericsson et al., 1993; Ericsson et al., 2007).

A Mann Whitney U test also indicated a significant difference between start age for detection (*Mdn*. = 14.01 yrs.) and traditional (*Mdn*. = 10.51 yrs.) talent identification. The ethics that guide the minimum physiological testing age in children led us to anticipate a considerable contribution from the starting age in the overall acceleration of expertise. This research identifies eleven years as the earliest testing age for detection talent identification in British Cycling but accepts children as young as five into their traditional talent identification program (British Cycling, 2020). The six-year difference between these two talent identification methods potentially results in detection cyclists having a greater diversification on skills which can have a positive effect of skill acquisition (Güllich, 2014; Güllich, 2017; Staff et al., 2020;

Vaeyens, Güllich, Warr, & Philippaerts, 2009). Conversely, traditional cyclists have specialized in their sport from an early age. Our results indicate that this was not advantageous, which agrees with research across multiple sports (Baker et al., 2009; Crisp, 2019; DiFiori et al., 2017; Yustres et al., 2019).

A comparison of cyclists from both talent identification methods with similar starting dates indicated a significant difference between the period to excellence in detection talent identification (*Mdn.* = 5.4) when compared with traditional talent identification (*Mdn.* = 7.2). Thus, a later engagement in the development of expertise resulted in faster skill acquisition, which supports the idea of critical periods in which individuals are likely to make an above normal response to exercise (Armstrong, Williams, Balding, Gentle, & Kirby, 1991; Baxter-Jones, 1995; Malina, 1994; Malina, Eisenmann, Cumming, Ribeiro, & Aroso, 2004). This concept is hypothesized to be reliant upon genetic programming (Viru et al., 1999) and suggests that developmental factors should align with task demands to facilitate skill acquisition (Armstrong, Williams, Balding, Gentle, & Kirby, 1991; Baxter-Jones, 1995; Malina, 1994; Malina, Eisenmann, Cumming, Ribeiro, & Aroso, 2004). This research suggests that the critical period for cycling detection talent identification is 11 to 16 years.

Therefore, we believe that a later starting age will be a consistent feature of research using physiological measures and that critical periods should be a feature of talent identification processes throughout sports. For example, a critical period of six years (11 to 16 years) for detection results in a more focused approach to talent identification when compared with the broad range of 22 years (5 to 27 years) of traditional talent identification, considerably narrowing the target field for selection.

Expert Age

Those participants selected by detection talent identification resulted in acquiring expertise 1.26 years (i.e., 21.17 – 19.91) quicker (see Table 3). Our results indicated that the period to excellence was significantly quicker for the detection cyclists. Therefore, the concept of critical periods (Viru et al., 1999) leads us to speculate that the synergy between talent and developmental factors which facilitated the later starting date and the specialized training also brought about enhanced opportunities for the further development of expertise (Svetlov, 1972). Although this research indicates acceleration in expertise, this does not necessarily occur at a uniform rate across the acquisition period (Scott, 1986).

Genetics and Individual Differences

British cycling utilizes measures of power output and anaerobic capacity within detection talent identification, considering these factors important for cyclists progressing faster in sport. An often-cited definition of talent states that it has “its origin in genetically transmitted structures” (Howe, Davidson, & Sloboda, 1998, p. 406) . Some researchers state that “the potential impact of genetics could be great, and thus further research in this area is warranted, in particular in relation to specific performance genes, training/learning genes and genes underpinning injury proneness” (Rees et al., 2016, p. 1044). Associations between component abilities and performance have been identified by genetics research, which has shown that a positive genetic profiling benefits performance. The ACE gene (Angiotensin-converting enzyme) has been associated with positive cardiovascular system and skeletal muscle adaptations (Montgomery et al., 1998; Yang et al., 2003). The ACTN3 gene (Alpha-actinin skeletal muscle isoform 3) has been found to be beneficial in elite power and sprint athletes (Chan et al., 2008; Yang et al., 2003) and the CKM gene (Creatine Kinase Muscle) has been associated with the response to training of VO_2max (Pennington Biomedical Research Centre, 2013). Although the current research suggests that detection talent identification leads to acceleration in acquiring expertise, it does not suggest that it is talent alone that determines the period to expertise. Research that specifically identifies the genetic determinants of expert performance is still very much in its infancy (see Ahmetov & Fedotovskaya, (2012) . In addition, it is likely that expert performance will be a result of a combination of genes rather than a single gene variant.

Indeed, the explanation of critical periods in acquiring motor expertise relies upon genetic programming for the appearance of new events such as growth, maturation and development (Viru et al., 1999). We speculate that innate individual differences can lead to variability in the period to excellence. Our results indicate the implementation of the Talent Team Programme by UK Sport as applied to British Cycling affects the speed of motor learning and development, we suggest it is utilized across multiple sports (see also https://www.uksport.gov.uk/our-work/talent-id/previous-campaigns).

Selection of talent identification measures

Traditional talent identification occurs by choosing high performing children with the expectation that their motor learning and development will lead to the same comparative expertise as adults. As sports developed, talent identification practitioners evolved their approach. Coaches deconstructed expertise into information processing components (Schneider & Shiffrin, 1977; Shiffrin & Schneider, 1977), reassembling into the complete performance (Griffin, n.d.; Lydiard & Gilmour, 2000). Tests involving subcomponents of cycling are identified as significant contributors to performance (Paton & Hopkins, 2001; Wattbike, 2010). However, it is likely that contributions from other factors such as anthropometric measures (Foley, Bird, & White, 1989) and genes not associated with these measures, (Davids & Baker, 2007) influence these results.

Thus, the measuring of subcomponents broadens the number of potential cyclists at the sampling period of 11 to 16 years of age, offering the opportunity to all within that age group to try-out. Selection by the appropriate genetic profile provides the opportunity for selection from other sports with a genetic profile akin to cycling. The qualitative analyses of the two track endurance gold medalists selected by these measures agree with this suggestion; both had keen interests in athletics and swimming before being tested in cycling. These results conflict with the idea that expertise is associated solely with practice (Ericsson et al., 1993) and agree with the hypothesis that innate ability contributes to expertise (Hambrick et al., 2018). Indeed, innate ability can accelerate expertise and is identifiable by specific talent identification methods.

It seems you might also consider how the different talent ID method may broaden the net at different sampling periods such that it identifies people with the appropriate genetic profile and potential for cycling but who for whatever reason may have been interested in a different sport and/or just did not realize that cycling fit their body type, etc.

Period to Excellence

Theorists who do not subscribe to a single factor hypothesis to explain expertise – the practice vs. talent dichotomy – endorse a multi-component explanation to expertise (Ackerman, 2014; Gobet, 2015). We suggest that our measure of the period to excellence offers a more holistic approach to identifying the time applied to acquiring expertise, as this not only includes practice but also recovery periods, which allows for physiological adaptations. Therefore, given the same level of expertise, it would be expected that times for the period to excellence would exceed deliberate practice.

There are pitfalls in determining the starting point of deliberate practice and correspondingly our measures, which we utilized to ascertain our period to excellence measure. This is highlighted in our data by the responses from the most decorated GB Olympic cyclist to the following questions:

When did you start to focus on your sport?

Response: 17.

At what age were you first coached for your sport?

Response: 24.

Ericsson et al. (1993) suggest that the starting point can be identified by either of these questions; yet the 7-year variation in this response highlights the difficulty in obtaining the actual starting point of deliberate practice. As a result, we took the most cautious approach by using the date the athlete first focused on their sport.

In addition, in the achievement of expertise we have selected the first senior international competition. Some athletes make the transition from junior to senior competition seamlessly and therefore the junior achievement date would seem to be applicable. We consider that, due to the importance of physiological capabilities in the cycling task, it would be prudent to choose the senior, or later attainment measure.

There are also operational differences between the calculation of the deliberate practice period (Ericsson et al., 1993) and period to excellence. This is largely brought about by the different domains of research, e.g., violinists and cyclists. Deliberate practice is defined as effortful activities designed to optimize improvement; it can be intermittent and is a measure of practice activities only. Our measure, the period to excellence takes into account practice, injury and physiological adaptation that require rest (Rivera-Brown & Frontera, 2012). Ericsson recently added to the deliberate practice hypothesis by stating that “the most important point is that high-intensity physical activity can only be maintained for a short period and thus its effectiveness for stimulating change and improvement of performance cannot be measured by its duration" (Ericsson, 2020, p. 170). Conversely, we contend that bringing about positive improvements in motor development are important and that high intensity physical activity in combination with rest contributes to expertise in cycling; for examples isometrics (Kordi et al., 2020), weight training (Tiberiu et al., 2020) and oxygen uptake (Paton & Hopkins, 2001) and should not be dismissed.

In order to attain cycling expertise, research suggests that maximal and submaximal physiological performance need to be achieved (Mujika & Padilla, 2001). To realize these physiological milestones, it is possible to apply a "power law" (Newell & Rosenbloom, 1981), equating the amount of time in acquiring expertise (the period to excellence) with physiological performance. Thus, the greater time applied equated to larger physiological gains. Indeed, cycling research indicates that the levels of aerobic fitness and off-road cycling performance were significantly associated (Impellizzeri, Rampinini, Sassi, Mognoni, & Marcora, 2005).

Deliberate practice

Although it may not seem immediately clear as to why research into music expertise should be used in sport, it is evident from the popularity of the deliberate practice framework in sports research that many researchers have taken the intention of Ericsson et al.'s (1993) paper to refer to expertise in general. Furthermore, in that paper the section in the literature review "Distinct Physical Characteristics of Elite Performers" (Ericsson et al., 1993, p. 394) largely focuses on the physiological adaptation that become apparent as sport expertise is attained – heart, lungs, bones and muscles including the quantity of fast and slow twitch fibres. Therefore, it is not surprising that it has consistently been applied to sport (for examples see, Baker, J., Côté, & Deakin, 2005; Helsen et al., 1998; Helsen et al., 2000; Hodges, Kerr, Starkes,

& Weir, 2004; Lombardo & Deaner, 2014; Ward, P., Hodges, N.J., Williams, A.M. & Starkes, J., 2007).

The deliberate practice hypothesis largely claims that talent (except height and weight in some sports, and the ability to engage in long durations of deliberate practice) does not contribute to the speed of acquiring expertise and that a minimum of 10 years of motivated practice is required to acquire expertise (Ericsson et al., 1993). The current research suggests a different hypothesis: it takes less than 10 years to achieve expertise, with disparities being a function of individual differences, in part related to talent (Lombardo & Deaner, 2014; Staff et al., 2020) but also associated with sport selection (Baker et al., 2005; Helsen et al., 1998).

Medalists

At the London Olympics, twenty-seven GB cyclists were selected across events that included track sprint and endurance, time trials, road race, BMX and mountain bike. The details of the medals awarded are listed in table 4. Eighteen were selected from the traditional group, of whom seven won medals consisting of eight gold and two bronze medals in of track and time trials only. British Cycling did not win a medal on either the road race, BMX or mountain biking.

Table 4. Talent identification and its contribution to the Cycling medal total at London 2012 Olympics.

	Quantity of Events		Medal (Gold-Silver-Bronze)	
Event	Traditional	Detection	Traditional	Detection
Track Sprint	3	5	2-0-0	4-1-0
Track Endurance	7	4	5-0-1	3-0-0
Road Time Trial	3	1	1-0-1	0-0-0
Road Race	4	1	0-0-0	0-1-0
BMX	2	0	0-0-0	0-0-0

Mountain	2	0	0-0-0	0-0-0
Total	21	11	8-0-2	7-2-0

The detection group consisted of nine of participants, of whom two had no prior experience, and seven had some cycling experience. These participants were selected to compete in track sprint, endurance and road race events. They won 45% of Team GB Cycling medals at London Olympics 2012 (see Table 4). The two inexperienced cyclists both won track team pursuit Gold Medals. Five with experience won five golds and two silvers in track and road race events; two cyclists did not win any medal.

At the 2012 London Olympics traditional talent identification follows the historical convention of selection since the first Modern Olympic Games in 1896, approximately 116 years ago. Conversely, we estimate detection identification has been taking place for at only about 12 years. The medal haul for talent identification method in London was yielded ten medals for traditional talent identification and nine detection talent identification. Thus, it would seem detection talent identification has a future in selecting our next Cycling Olympians.

Limitations

Our sample size was relatively small, which might result in skepticism with respect to the generalization of the results into other fields. However, it should be noted that it is normally accepted that sample size is context-dependent (Lenth, 2001) and our statistical tests were suited to small populations (Field, 2009). While not perfect, our methodology is recommended in hard-to-reach populations such as elite athletes (Staff et al., 2020). We attempted to mitigate this by using online data collection methods, which are considered at least as good as in-person data (Casler, Bickel, & Hackett, 2013; Gosling, Gaddis, & Vazire, 2007; Vazire & Gosling, 2004).

The current research provides an important comparison between talent identification methodologies within British Cycling. We are somewhat surprised that such comparisons are not published or are not the norm in performance overviews and the assessment of resource efficiency. Is there an expectation that detection will produce expertise and the comparison with traditional methods is unproductive? Researchers have suggested that talent identification consists of highly rationalized myths rather than highly efficient norms (Barth et al., 2019); we suggest that the lack of such research is a good example of this attitude.

Summary and Conclusions

What are the implications for resources utilized in developing methods that contribute to the acceleration of expertise? The objective of talent identification is to assess athletes, identify potential for senior elite performance and recruit them into sport-specific programmes. Once athletes are selected, the financial imperative is to ensure that all practical means are used to accelerate the acquisition of expertise. This involves optimizing coaching, competitive opportunities, medical and scientific interventions (Vaeyens, Güllich, Warr, & Philippaerts, 2009) . The detection methodology has a number of benefits for talent identification: (a) increasing the pool of athletes suitable for potential Olympic selection, potentially leading to greater competition for places and higher performance standards; (b) increasing the efficiency in the allocation of resources brought about by faster skill acquisition; (c) providing information on associations between genetic factors and likely performance outcomes; and (d) introducing a wider range of potential participants to Olympic sports. UK Sport has utilized this methodology across other Olympic sports (https://www.uksport.gov.uk/our-work/talent-id). Further research would be required to determine if these results could be generalized across all sporting domains.

This research has shown that the speed of acquiring elite performance utilizing detection talent identification was superior when compared to traditional talent identification and proposes a methodology that associates individual differences with the speed of acquiring expertise. These results indicate that detection talent identification is a quicker route to develop expertise and supports the introduction of the Talent Team Programme introduced by UK Sport as a precursor to individual Olympic Sports talent identification programmes. It questions the assumption that early learning is necessary for acquiring expertise and supports the hypothesis that both critical periods and therefore genetic factors align with tasks, contributing to accelerating the acquisition of expertise in sports. Innate talent is a rare commodity in motor learning and development, and to ignore athletes' genetic potential in talent identification is not rational. It is hoped this paper will promote debate into a more rounded understanding of factors that contribute to the acceleration of expertise.

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