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Title of Thesis:

A comparison between Talent Identification and Development (TID) for badminton in China and the UK

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Abstract

Badminton England created the first world badminton championship in 1898, known as the All England Badminton Championship. Since 1992 badminton has been an Olympic sport consisting of five disciplines, with fifteen badminton medals offered at each Olympic Games. Great Britain (GB) badminton won two Olympic medals between 2000 and 2008. China Badminton won 38 Olympic medals between 1992 and 2012. This leads to a number of questions, not least of which is to understand the success of China Badminton when compared with GB badminton, and the reasons behind that success.

The research set out below is a study into badminton talent identification and development (TID) in China and the United Kingdom (UK). The study compares and contrasts the relative success of the systems used in China and the UK, discussing the similarities and differences in both country's badminton TID programmes.

This research followed a mixed methodology using three different types of research. These included documentary analysis of both countries' sports systems and badminton programmes from an existing wide range of documentation. A total of forty Chinese and British national badminton players participated in the questionnaire survey. Eight national coaches from both countries were chosen for semi-structured interviews.

The results indicated significant differences in the application of TID in badminton in both countries:

- The sport system's impact on athlete's development opportunities;
- Differences in the identification of badminton talent progress; based on age and testing;
- Differences in player development; training age, training hours and training years;
- The age at which players specialise in badminton and the age at which they reach peak performance.

This research presents world class badminton players' comments on the attributes they considered were important to success. This study shows that specialisation in badminton at an early age and building up both the quantity and quality of training can have a long term

beneficial effect on individual performance. This is complemented by the findings of this study that confirmed the importance of talent identification (TI) and talent development (TD) in high performance badminton programmes. Therefore, to achieve success at an international level requires a player to specialise in badminton early in their life coupled to many hours of directed training.

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1. Introduction

The exact origins of badminton are unknown; there is some evidence that over 2,000 years ago an ancient game was played with a shuttlecock and racket. In the 19th century codified rules of this game were developed in Britain, where it took its name from Badminton House, the Duke of Beaufort's residence in Gloucestershire (Guilain 2013, pp.47-48). Since this time the game of badminton has proliferated across the world. A dynamic sport, at recreation level the sport can be played easily by people of all ages. It is a non-contact sport, which has been referred to as a physical version of a contest comparable to chess (Li 2007). The Badminton Association of England was established in 1893, much earlier than the China Badminton Association, which was established in 1965 (Table 1). Despite the relatively early establishment of the UK's various badminton associations and unions, the Chinese lead the medal tables at the Olympic Games and many major championships.

Year	Association
1893	Badminton Association of England
1899	Badminton Association of Ireland
1911	Scottish Badminton Union
1928	Welsh Badminton Union
1965	Badminton Association of China

Table 1 Year of Badminton Associations Establishment UK and China.

Initially at international level, European countries like Denmark, England, and Germany dominated badminton. However, in the past few decades, the emergence of badminton as a global game has seen the balance of power shift to Asian nations, most notably, China, Indonesia, Japan, Malaysia, and South Korea. All of whom seem to produce a conveyor belt of world class players. At elite performance level racket sports like badminton require mastery of complex technique, in addition to physical attributes such as fast movement. The sport is played with a high intensity, which demands excellent levels of fitness. A world class badminton player requires a wide range of skills and abilities, including: racket skills incorporating different techniques, co-ordination, agility, flexibility, speed, strength

and power, core stability, reflexes, consistency, tactical awareness, spatial awareness, peripheral vision, and psychological aptitude (Li 2007). The development of a badminton athlete's wide range of abilities and complex skills is not considered to be straightforward and therefore, by implication, a training and development programme is required. Williams, Best, Alvar and Cronin (2014) have mentioned, for example, that both athletes and practitioners should recognise and value the importance of such programmes in the development of sporting talent.

Moreover, it is important for high performance programmes to select the right athletes and train effectively and efficiently to prevent wastage in terms of time, energy, and funding (Li 2007). This selection has come to be known as talent identification. Perception suggests it is easier to work with young players who have potential and realistic prospects of becoming good at racket sports.

This research will investigate the phenomenon of talent identification. There is a popular debate around the subject of talent. Baum, Owen and Oreck (1996) and Cheng (2008) argue that individuals are born to be champions suggesting there is something genetic or innate in their make-up which lends itself to athletic achievement. However, Coyle (2009) and Syed (2010) argue that success comes from the environment and opportunities to learn and develop through time. This research specifically looks at whether talent can be identified and developed in badminton.

Since 1992, badminton has been included in the Summer Olympic Games. In recent years China has demonstrated a continued domination of competitive badminton at a global level. This is evidenced through results in Olympic Games. Badminton offers fifteen medals in each Olympic Games. In the Sydney Games of 2000 the Chinese team won eight medals in total, which included four gold medals out of the five that were available. In 2004, at the Athens Olympic Games the Chinese team won five medals, which included three gold medals. In the 2008 Beijing Olympic Games, the Chinese team again won four of the five gold medals available. During the same period the GB badminton team won a bronze medal at the 2004 Athens games and a silver medal at the 2008 Beijing Games. Table 2, below, shows the medals won by the ten leading competitive badminton nations. It shows that China has had a stronger performance overall than the UK, ranked in sixth place some considerable way below the performance of the Chinese teams.

Olympic Badminton Medal Table					
Rank	Nation	Gold	Silver	Bronze	Total
1	China	16	8	14	38
2	South Korea	6	7	5	18
3	Indonesia	6	6	6	18
4	Denmark	1	2	3	6
5	Malaysia	0	3	2	5
6	Great Britain	0	1	1	2
7	Japan	0	1	0	1
7	Netherlands	0	1	0	1
9	India	0	0	1	1
9	Russia	0	0	1	1
Total		29	29	33	91

Table 2 Olympic Games Badminton Medal Table by Nation 1992--2008.

UK Sport's Elite Funding Programme has awarded grants to GB badminton in each of the last three Olympic cycles: a combined £8.7 million for Athens 2004 and Beijing 2008, a further £7.4 million towards London 2012, and another £5.7 million towards Rio 2016 (UK Sport Historical Funding 2015). GB badminton has benefitted from fairly substantial investment, much of which comes from National Lottery and Exchequer sources. It is hoped that this type of investment will deliver medals. Funding is prioritised to sports with the perceived greater ability to secure medals in each Olympic cycle (UK Sport Badminton 2015).

Funding for Chinese badminton is not officially published, but the Chinese Sport Ministry stated between 2001-2004 that the central governing body of Chinese sports received a

budget of 1 billion Yuan (ca. US$122 million, £94 million) each year, and between 2005 and 2008 the figure was 2 billion Yuan (ca. US$244 million, £188 million) each year (Hong 2008). Those funds supported Chinese athletes in the 26 sports they participated in at the 2004 Summer Olympics in Athens, and the 28 sports the respective Chinese athletes participated in at the 2008 Summer Olympics held in Beijing. In particular, badminton, table tennis, and diving are three sports that China has strategically targeted for Olympic success. In 2004, China won 13 out of the total 17 gold medals available in those three sports.

Relatively speaking, there has been considerable investment in elite sport in both countries and both involve using public funds. Both models have produced outcome-based returns, in this case Olympic medals. This type of funding is largely focused on those with a chance of medalling in the next Olympic cycle. For example, UK Sport's World Class Programme spends significant finance on athletes at 'Podium' level. Podium athletes are those with a chance of medalling at a major games or championships within 1-4 years. Smaller investments are made to athletes at the next level, 'Podium Potential'. These athletes are considered medal potential within 1-8 years (UK Sport 2012). This tiered approach to funding with greater resource offered to those closer to elite level success, supports outcome based objectives such as Olympic and Paralympic medals. Those with potential but further away in time from medalling are perceived as a greater risk and are generally offered less.

The Chinese system in badminton has continuously achieved success on the world stage over a period of 20 years, but the subject of how China develops its elite badminton players is relatively unknown. There remains a lack of badminton-specific TID research. Further research is unlikely to provide a definitive way to proceed in this area, being so multifaceted in nature. Without more comprehensive research doubt could be placed on the value of existing badminton development programmes. This study is interested in researching the structure of Chinese badminton and the support system it operates and comparing and contrasting this with the equivalent provision in the UK.

The aim of this study is to find out the systems operating in China and the UK. It considers and investigates the respective influences on athletes and their development in the performance pathway. This study will also to look at processes involved in producing a

successful athlete, from a beginner to elite-level badminton player in China and the UK. It will focus on talent selection, athlete development, coaches' viewpoints, and training regimes. It considers the key components of an elite-level badminton player and investigates if any of these areas are identifiable in children and at what ages these become evident. It reflects on the possible sources and whether this is the product of training and development or if there is some underlying element of natural selection. Furthermore, this study will explore the two countries' differences and similarities in Talent Identification and Development (TID) in badminton.

In this project, Chinese and GB badminton elite athletes and coaches will be asked for their opinions in the exploration of the key elements which have a significant influence in elite sport, focusing on talent identification tools and methods through to the athlete development pathways that are required to produce world class badminton players. Finally, the project seeks to make a recommendation of areas for further research.

2. Literature Review

2.1. Introduction and Purpose of Review

This chapter will examine a number of models, theories and case studies relating to Talent Identification and Development (TID) in sport in general, and badminton in particular. The aim of the review is to provide an insight into Talent, Talent Identification, Talent Development theory and practice as other writers in this field have investigated it (Abbott and Collins 2002). This will set a framework for the remainder of this thesis where concept and application will be used to compare TID implementation in China and the UK.

TID is both an art and a science involving a complex blend of scientific knowledge and assessment, alongside coaching skills (Bloyce and Smith 2012). From sport through the arts to education, research is taking place in a number of disciplines to help identify those with greatest potential for success in their respective fields. Doll-Tapper (2008) connected TID more with professional training, leading to an approach in which young athletes are developed not just via observation from coaches and performance results, but also from teams of physicians. Profiles of athlete development athlete created from monitoring and evaluation allow specific weaknesses and strengths to be identified, allowing the provision of individual training programmes and specialized systematic training for children. However, Higgs (2008) and Gulbin (2008) argue that when it comes to the identification and development of young talent athletes there are several visible trends: first, children at an early age are given professional training. Second, an increasing amount of technology is being adopted in professional training. Third, coaching theory is applied not just to elite sports but also to sport for all and health sports. Fourth, specialization in a single sport is being postponed. This would lead to the view that TID should also concern sport participation across the lifespan of the athlete rather than only aiming to develop Olympians. In recent years, TID has increased in popularity across the world. Governing bodies of sport in many countries have invested considerable funds and resources into talent identification and development. Many nations aim to improve Olympic performance and success in international sport (Cobely, Schorer and Baker 2012).

In sport, talent identification recognises individuals already competing in the sport and also those not competing; with the right developmental opportunities individuals are able to display the potential to perform in that sport (Wang, Fen, Bei and Qu 2005). The latter

form of talent identification rarely occurs in some countries where the choice of sport is often influenced by the tradition and culture of the nation (Wang *et al.* 2005). Across a broad spectrum of disciplines, both in academic and non-academic circles, there is ongoing research taking place in a bid to highlight individuals with latent talent for success in their field. TID involves a complex blend of scientific knowledge and assessment, alongside an effective and systematic training and development programme (Wang and Sheng 1995).

Arguably, TID is designed to proactively seek out individuals who possess the raw materials necessary for world-class success and who respond positively to an intense training and competitive environment (Doll-Tepper, 2008). This review also considers the efficiency and effectiveness of resources invested in TID programmes. Pertinent factors are: What qualities and attributes are important for badminton? When is the right time to identify potential stars of the future? And, when is the right time to start specialised training?

2.2. Defining Talent

There are many different definitions causing some ambiguities in the distinction of "talent". The word 'talent' is defined as a natural aptitude or skill (Concise Oxford English Dictionary, 2000). Collins and Buller (2003) add to this to include the ability to display exceptionally high performance in a domain that requires skills and training. There is some agreement among authors that talent can be expressed as a "special natural ability or skill" (Lu 1996, p.760). Randak (1998, p.47) refers to a person with talent as being "gifted, accomplished, skilled, masterful, clever and excellent". Barbuto and Wheeler (2002) build on this by suggesting that a talented person possesses an unusual innate ability in some field or activity that leads them to produce above-average results. This definition is seen as radical amongst scientific researchers who believe that talent is solely connected to innate abilities (Duran-bush and Salmela 2001). Furthermore Howe, Davidson and Sloboda (1998) identify five properties to foster talent appropriately, which have some commonalities with previous comments. Firstly, a genetic origination, meaning talent is partly innate; secondly, the entire results might not be seen from the outset, but there will be indications enabling skilled personnel to recognise the existence of talent before excellent levels of performance are illustrated; thirdly, initial signs provide a foundation for foreseeing who is likely to shine; fourthly, only a few children are talented, if all were then there would be no way to

distinguish future levels of success; fifthly, talents are usually restricted to certain areas. Moon (2003) adds an element of intrinsic value to the definition by suggesting talent is an exceptional ability used to deliver difficult to obtain ambitions that fulfil personal interests and values. Talent comes from individual personal characteristics, values, and qualities.

In summary, arguably there are three components in the definition of talent. Firstly there is some natural, innate, 'God given' aptitudes and capacity. Secondly, talent is a developed ability and finally, there are aspects of individual character values and attitudinal motivation. Many authors believe talent is multi-dimensional (Helsen and Starkes 1999; Howe, Davidson and Sloboda 1998; Zheng 2005; Wang *et al.* 2005). Overall having reviewed the literature the author is inclined to agree with the multi-dimensional definition of, 'talent'. It is someone can show extra special ability and skill, and produce above-average results, talent is also multidimensional and can come from individual personal characteristics, values, and qualities. The difference between talent and giftedness is: talent can be developed skills or abilities, but giftedness is someone who possesses an unusual innate aptitude or genetic capacity, for example, height, learning ability.

2.3. Defining Talent Identification

Talent Identification (TI) is a systematic series of actions, the purpose of which is to recognise the potential for individuals to excel in a particular field or sport. These individuals may or may not already be participating in that sport (Vaeyens, Lenoir, Williams and Philoppaerts 2008). TI is a linear process that is designed to be used by experienced coaches, sport scientists, and sports scouts to bring individuals with potential into a talent programme.

Wang *et al.* (2005) highlighted that TI is in place in high performance sporting structures where the programme is presumed to be an important predictor of the potential for performance excellence in the future, as it measures such parameters as height, body size, shape, and the physical capacity to undertake the training required. As a result Wang *et al.* (2005) postulated that a TI programme would help focus available development resources and hence minimise wastage. For example, national governing bodies of sport have limited funding. Funding levels are heavily influenced by results or medals in major events and Games. Medals in these environments provides increased likelihood of funding

continuation or even increased funding. Therefore, high performance programmes focus resources on quality rather than quantities. Coaches, experts and facilities available are focused on talented groups of athletes. There has, however, been different emphases placed on TI; Bailey and Morley (2006), and Williams and Reilly (2000) considered that TI is better suited to act as a guide to when it is best to accelerate an individual's development path. If the basis of TI were correct in all its aspects that potential future performance can be determined by measurement alone, then it would appear reasonable to presume that any development programme would only need to look for these qualities in athletes to ensure success. There is no definitive empirical research evidence with regard to the use of TI in specific sport in terms of its application from young children to elite athletes.

Cobley, Baker and Shorer (2012) have cast doubt on existing TI as they consider it to be limited in its use, for example, using measures such as speed and agility, as an indicator of potential could be impacted more by the environment and nutrition. In other words these measures may have been influenced from the quantity and quality of support and training individuals have received rather than being an indicator for future performance potential. Therefore, is individual potential or talent measurable? In a similar vein, Vaeyens *et al.* (2008) have criticised TI's use of one single point time measurements as an indicator of long term talent prediction; this is due to inter-individual growth rates having the potential to be so different, meaning that using one set of definitions at one moment in time becomes unreliable. However, "potential" is identifiable through coaches' observations and sport scientists' tests, and it is an ongoing process. On the other hand "talent" understoood as development ability would also be identifiable through the coaches' observation and performance results. Therefore, although TI is difficult to measure, this does not stop researchers from looking to find answers, hence the value of TI in high performance sport.

2.3.1. Talent Identification: The Early Maturing Child

One of the major challenges for Talent Identification (TI) in sport is that children mature at different ages and at different rates (Vaeynes *et al.* 2008; Cobley, Wattie and McKenna 2009). It has been observed that children of the same age can vary in height, strength, muscular development, aerobic capacity, and endurance (Cheng 2008). Vaeynes *et al.* (2008) added that different rates of maturity can be evident in such areas as motor skills and general intelligence. Where TI purely compares results based on chronological age,

some children may be disadvantaged or advantaged based on their level of maturity, for example, earlier maturing children will have an advantage in sports such as basketball, rugby, soccer, and swimming where characteristics associated with early maturity (height, weight, strength, and speed, amongst others) are important (Cobley *et al.* 2009). Conversely there are sports like dancing and some disciplines within gymnastics where the early onset of maturity may be a disadvantage (Cobley *et al.* 2009). For instance, in gymnastics if an athlete is too tall or if they have too large a frame they are likely to be disadvantaged in terms of their development within these sports.

Another issue with looking solely at a child's chronological age is at what point in the year is the child's birthday? If their birthday occurs in late December as opposed to the early January of the same year they could be seen as being the same age whereas in terms of maturity they could be nearly a year behind the child born in January. Most junior sports are split into annual age group competitions and categories. Children born at the latter end of the respective sporting years could therefore be disadvantaged (Barnsley and Thompson, 1988; Barnsley, Thompson and Barnsley, 1985). Vaeynes *et al.* (2008) and Cobley *et al.* (2009) coined a term for this observation, the "Relative Age Effect" (RAE). The rate of maturity in a child can be significantly influenced by this difference of 10 to 11 months of development that one child can have over another in terms of height, build, or co-ordination. This can translate into the TI's original intentions being disrupted as it could lead coaches to confuse talent with age. This could have serious implications for TI programmes as athletes identified as "talented" are normally given the chance for more practice, better coaching, more support, and more competition as well as greater rewards (Abernethy 1988).

Cobley *et al.* (2009) found that in some sports, children who were born earlier in the year were significantly represented at elite level mostly in team sports. In sixteen countries fourteen sports were assessed and it was found out that hockey had the highest RAE, but the study found that hockey had received more study attention measured at 31.3%, followed by football, 30.9%, baseball, 13.4%, basketball, 6.1%, and then volleyball at 5.7% (Cobley *et al.* 2009). This study paid significant attention to team sports, while individual sports like table tennis, badminton, and tennis place higher demands on skill and technical ability. In these sports dates of birth seem to have less influence on success in senior competition.

The consequences for participation in sport and for Talent Identification (TI) of the preceding findings are considerable, as an early maturing child will have higher physical capabilities, meaning that they will be more able to perform at a higher level at that moment in time, than a late developing child who matures in line with norms for their age. The question remains of whether talent displayed at one age (or biological maturity) automatically equates to continued development in later life. It assumes there may be less RAE in individual sports or sports that require high skill levels and techniques (for example, badminton, golf, and table tennis).

Unierzyski (2003) looked at the top 100 ranked tennis players in the world; these included Roger Federer, Kim Clijsters, Guillermo Coria, and Justine Henin. Those players compared with others in the same age group at ages 12 or 13 were three or four months younger with slimmer bodies, less physical power, and more agility. From these findings it can be seen that while biological maturity may make an impact in junior tournaments it did not lead to the athlete having a significant advantage or likelihood of future success in senior competitions, as had been seen in team sports or sports placing a heavy reliance on fitness components such as speed, strength, and power, all qualities associated with early maturity (Abernethy 1988). There are some similarities between the racket sports of tennis and badminton; therefore should badminton consider this phenomenon? Unfortunately there are no parallel studies for badminton in terms of measuring the effect of biological maturity.

2.3.2. Talent Identification Approaches: Natural Versus Scientific

During this part of the analysis it is established that Talent Identification (TI) procedures have been categorised into, "natural selection" and, "scientific identification" **(**Wolstencroft 2002; Lin 2005; Wang *et al.* 2005). There have been a number of debates as to the viability of talent identification (Cobely *et al.* 2012; Vaeyens *et al.* 2008; Durand-Bush and Sakmela 2001). This is in large part driven by the different approaches and structures adopted in different countries that have been designed to suit the different criteria laid down for the sport programmes within these countries.

1.The natural identification method

The natural identification methodology is based on the principle of gradually introducing young children to different sports in a bid to help to develop abilities; as progress is made, involvement levels are increased as is the technical and supplementary training associated with the sport (Wolstencroft 2002). Figure 1 (below) shows the gradually transition and difference for each stage of development talent.

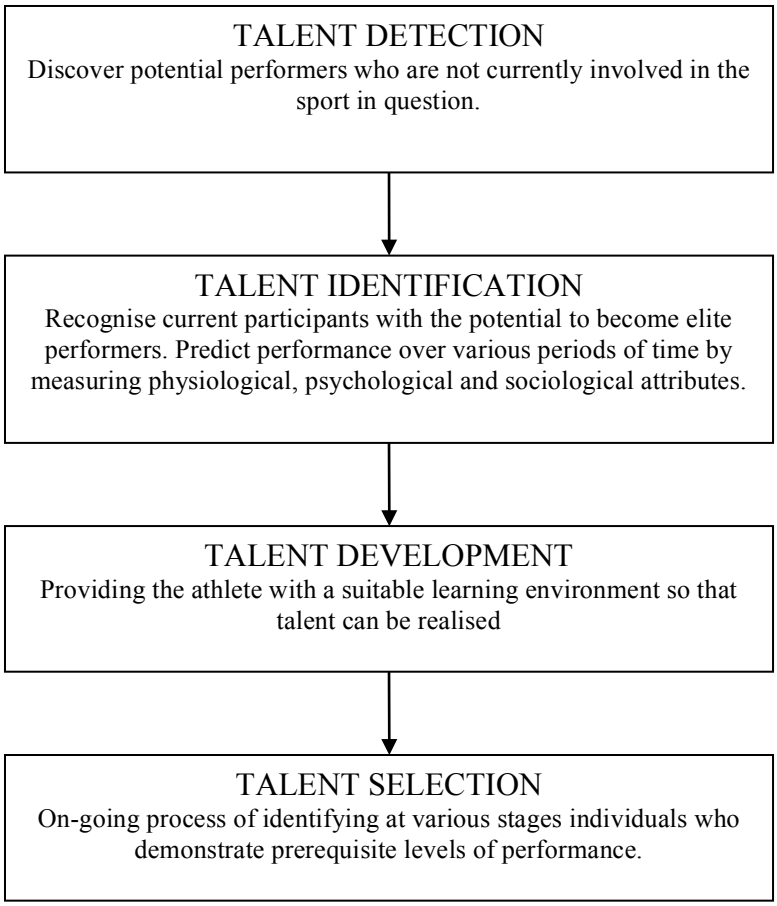


Figure 1 The Stages of the "pursuit of excellence" (Williams and Reilly 2000)

The critical aspects of the natural identification methodology are firstly to distinguish and recognise the potential talent in young children based on results. Secondly, selection policies determine the youths who are able to perform the best at the time of testing or by winning matches and tournaments. This favours individuals who are more physically mature. It also favours those who have entered more tournaments and gained competition experience and ranking points, but in doing so may have missed out on aspects of skill

development. Unfortunately for the efficacy procedure highlighted the importance placed on results encourages young children to enter many tournaments during the early stages of development, rather than learning specific skills and techniques. It has been suggested that skill development at a young age in badminton is one of the most important areas, in order to open opportunities for future success at world-class level (Wang and Sheng 1995).

The other major aspect influencing results over age-related peers is biological maturity. Factors such as height and strength can have a major impact on physical fitness tests and results in tournaments. A third critical aspect is the ability for children to access opportunities. For example, children who play regularly and access good coaching are more likely to perform well both in tournaments and in physical tests. In turn, good results can lead to selection for representative squads, further coaching, facility access and competition, which widens the performance gap even further. None of this is based on performance potential but all is based on physical maturity and perhaps opportunity and provision. Often the factors can combine together as evidenced earlier with the relative age effect argument (Schorer *et al.* 2009).

However, the distinction between performance potential and current performance level is important. The key question is: Do these young children have the capacity to achieve at senior level in the future?

2.The scientific talent identification method in sport

The scientific talent identification method is used by specific governing bodies of sport with the intention of identifying talent by making certain specific indicators to the sport, for example, family history and bone scanning tests. Data derived from these indicators is used to predict anthropometric measurements, such as height for sports like basketball. Unlike performance results, subjective judgment or physical fitness measures, the scientific identification method values innate anthropometrical measurement with future prediction. Weight, height, length of limbs and body shape might significantly influence levels of performance in several sports (Burgess 2009).

Successful talent identification requires a combination of statistical information, anthropometric measurement, body shape and sport compatibility, physical abilities, physiological testing, levels of performance and results together with subjective selection

(Burgess 2009). A mix of all these factors can help predict success within specific sports (Russell *et al.* 2005). Scientific tests and measurements are applied to a number of specific areas in a wide range of disciplines and professions. For example, in the twentieth century psychological testing was introduced to the selection procedures for new pilots as it helped identify people more suitable for pilot training. This had three effects: firstly, to reduce the dropout rate; secondly, to increase the speed of development; and thirdly, it saved financial and human resources in the training process. Wang *et al.* (2005) suggest the type of testing involved included things like logical thinking, creative capacity, and intellectual ability; different sensory analyses including visual, audio, touch and kinesthetic; and spatial visualisation assessments and checks on motor memory.

In China these scientific tests are applied to a number of specific areas such as anthropometrics, physiology, and psychology to assist coaches and other sports professionals to identify young athletes suitable for certain sports. Examples of these tests include: a genetic history test of the athlete, blood type, hand plates and x-ray (to predict growth), anthropometric measuring, physiological tests, and psychological tests (Wand *et al.* 2005; Wang and Cheng 1995; Zheng 2005; Cheng 2008).

Profiling young children with medical, physical, and anthropometrical tests can be useful, for example muscular-skeletal screenings which identify weaknesses, therefore highlighting areas to target with specific training. Early profiling and testing can help identify those with scores above the norms and those of their peers, however there are some crucial issues. Firstly, it does not guarantee positive attributes will remain throughout maturation into adulthood. Even height is not always stable over time. Secondly, some approaches cannot be conclusive and involve high-value resources; in such cases the returns may not justify the means. Thirdly, by dismissing unsuccessful youngsters during growth to adulthood, a tangible period, which is multifaceted potentially, eliminates future champions (MacCurdy, Miguel and Mclnerney 2006). Therefore Talent Identification (TI) has both its strengths and weaknesses as it is used in high performance sport however, overall, TI has a track record of increasing the prediction of the chances of future success (Russell *et al.* 2005).

2.3.3. Summary of current methods of talent identification

As Wolstencroft (2002) stated, there are two methods used to identify talent, "natural selection" and "scientific identification". Natural selection is based on current sporting performance and results. Scientific identification involves an individual's profile of results across physiological, anthropometric, physical, and psychological tests amongst others to predict the likelihood of future success in adult competition.

Scientific talent identification tests demonstrate that sport scientists use measurement and statistical results analysis to predict the potential of children in different sports and which sports they might be more suited for, which could therefore lead to early success (Wang *et al.* 2005). For example, often athletes find themselves in the wrong sports after many years of training or in later life without this type of analysis. The positive benefit of TI from within a sport increases the likelihood of reduced wastage of both time and financial resources (Peltola 1992).

Talent identification methods implanted and developed in a structured system should be supported by continuous selection and de-selection (Wang *et al.* 2005). The key component is for those athletes that are identified as being expected to succeed or fail against established performance criteria. The process at each stage may be designed to predict future performance. Unfortunately TI is vulnerable to inconsistent results as there are no guarantees of success. Two assumptions may be made: First the TI ability to reproduce the same results over and over again is a sign of a continuous approach to talent selection rather than only being done once, provides an opportunity for nurturing and development. Hopefully this would allow athletes to fulfill their potential. Consistent continuous TI might give more chance to late maturing children. Secondly, instead of TI approaches concentrating on a young child's sport performance and a combination of test results, it should consider the individual's capacity and learning abilities. Thirdly, each sport demands a sport-specific TI approach, giving consideration to talent transfer in young children; for effective talent transfer in badminton it must occur early for developmental reasons (Wang *et al.* 2005).

2.4. Defining Talent Development

Talent development (TD) in sport refers to supplying athletes with a suitable environment in which to develop and accelerate performance (Abbott and Collins 2004). TD is designed to proactively seek out those that possess the raw potential materials to pursue world-class success. TD seeks to support talented individuals who respond positively to intense training and competition (Doll-Tepper 2008). TD programmes consist of commonalties including: access to facilities, coaching, sport science, sports medicine, lifestyle support, training and competition, as well as financial support. In this respect, TD programmes focus on developing athletes to fulfil their potential. Syed (2010) suggests that performance outcomes are not the result of talent alone, but rather the result of purposeful practice and years of development. Therefore TD requires a wide range of resource support and is a long-term process. This research will compare the TD in badminton from the UK and China.

2.4.1. Rule of Practice

Ericsson (1993) suggested the ten-year rule or 10,000 hours of deliberate practice is required to gain mastery in any field. The "rule" would be the norm for the amount of time needed to train in a particular sport to the point where mastery has been gained. The proviso was that the quality of training needed to be sufficiently high as well as the quantity of time spent on practicing the discipline. There can be variations to this rule, often influenced by the popularity of the sport and the numbers participating. Success in minority sports may break this rule (Cobely, Schorer and Baker 2012). Perhaps even the type of sport and the level of skill required can often lead to athletes beating this rule. This previous route has become more formalised through UK Sport's national talent scheme, Sporting Giants. For example, the UK Sport TI programme picked up Helen Glover, 26, in 2008. At London 2012 she became Britain's first female Olympic Gold Medalist in rowing. Glover only started rowing four years before competing in the 2012 games, therefore making it impossible for the 10,000-hour or ten-year rule to apply.

Lombardo and Deaner (2014) have stated that in some sports it is not necessary require a long term of deliberate practice to reach expert level. They explored the development of sprinters and their first finding was that most sprinters achieved world-class performance in less than five years, and more than 50% of the Olympic sprinting champions reached

this level in three years or less. Their second finding was every expert sprinter was identified exceptionally fast prior to receiving their initial formal training. As a result of these findings, Lombardo and Deaner (2014) highlighted that because speed is crucial in many sports it was reasonable to infer that innate talent is an important factor. This contrasts with the ten–year/10,000-hour model that maintains that with specialised training and coaching anyone can become an expert in any field; there appears to be no place for anything akin to innate talent. There is a limitation on the ten-year/ 10,000-hour model to be considered, which is the possible drop-out effects; many individuals striving for expertise may give up once they realise they are not good enough. Although, the ten-year/10,000 hours of practice model has been applied in many sports like swimming, distance running, and tennis for example (Baker 2003), other research (Seibold 2010) has shown that to achieve a place in the top 100 of many sports can take more than ten years of training and five years of competition. This research points to it not being a simple, "tick box" exercise of committing to a number of years of training necessary for the attainment of the desired level of expertise.

A number of researchers believe excellent performance is related to the quantity and quality of practice. Innate talent is only credited with a small role (Durand-Bush and Samela 2001; Ericsson, Krampe and Tesch-Romer 1993; Howe, Davidson and Sloboda 1998). Some researchers describe talent development as a process of transforming the individual from gifted to talented (Vaeyens *et al.* 2008).

The next section explores early specialization in a single sport, including benefits on a fast-track approach to development and the consequences of early specialization.

2.4.2. Early Specialisation and Deliberate Practice in Sport

Global sport has become increasingly focused on the search for a fast-track formula to success. Early achievement has been the result of channelling young children to specialise in a single sport at an early age (Wang and Sheng 1995).

Wiersma (2000) defined early specialisation as young children concentrating on one sport, with deliberate practice and development in that sport on a year-round basis. Baker, Cobley and Fraser-Thomas (2009) proposed that early specialisation in sport has four

attributes: Firstly, young children starting at an early age in sport; secondly, there is a clear focus and only participation in a single sport; thirdly, training is at a high volume and intensity; fourthly, there is frequent participation in competitions in that sport from an early age. Many researchers strongly believe early specialisation is important for future success. Ericsson *et al.* (1993) demonstrated the importance of development towards expertise in any domain, in that early specialisation was related to "deliberate practice", that is the commitment to practice with the main reason being the goal of improving performance levels. Individuals are required to start this form of training early, otherwise it becomes difficult to catch up with those individuals who started this specialised training at an earlier age.

There are studies which support the ten-year rule, deliberate practice, and early specialisation (Baker 2003; Baker *et al.* 2009). It was found that expert athletes focus on training and development in a single sport, which should not be confused with participation in many recreational sports in their youth (Weng *et al.* 2005). Weng *et al.* (2005) also suggested deliberate practice in a single sport is considered as essential for athletes to improve future performance levels. However, there are also a number of views against early specialization, with the opposite perspective being that early diversification presents alternative pathways leading to elite levels of performance (Wiersma 2000; Baker 2003). First, it can stifle sociological and psychological development by social isolation to single sport. Second, there are injury concerns and various imbalances created by repetitive actions associated with a single sport. Third are concerns about withdrawal rates when children experience a lack of fun or enjoyment. There are similar views from both Higgs (2008) and Gulbin (2008), who suggested that later specialization after participation in a multi-disciplinary sport programme is more likely to lead to increased performance than early specialization.

Broadly speaking, athletes in different sports peak at different ages, for example, gymnastics has an early peak which results in most gymnasts retiring from elite level competition in their early twenties; this revolves around specific components of fitness that are required, for example flexibility. Whilst in other sports athletes will not reach their peak until their late twenties or early thirties, for example, squash, football, and hockey; this again revolves around the physical fitness components, technical, and tactical development and experience. Other reasons for different approaches in different sports

include the skill specialisation required. For example, in a sport like rowing, a person that has never taken part in rowing can at university age take up the sport and become successful even on the Olympic stage. Whereas, in a sport like badminton the skills required to compete successfully at a world-class level take many years of practice. Research in which 31 of the world class international badminton players were interviewed found an average age of between seven and nine years of age when they began to focus on training in badminton; and that it was not until the age of 18 they started to achieve some success on the international stage (Badminton Information, 2011). In other racket sports, such as tennis, children are starting to receive specialised training at the age of six. Many children at this age are already at tennis academies (Seibold, 2010).

The next section investigates the different stages of talent development, that is, the development of the young, untrained child into an elite adult performer. It also looks at the different approaches used to develop athletes, including those identified by Bloom (1985), Cote (1999), Balyi (1999) and Durand-Bush and Samela (2001).

2.5. Models of Talent Development

There are several different talent development models (Bloom 1985; Cote 1999), some of which have been produced on the experiences of elite athletes by researchers. For example, Bloom's (1985) Stages of Talent Development model was developed through interviews with world-class tennis players and Olympic swimmers. Cote's (1999) Development Model of Sports Participation was developed through the study of four Canadian sports families from rowing and tennis. The most popular model is Long Term Athlete Development (LTAD) (Balyi and Hamilton 2004), as it has been adapted by many government sports organizations. More recently, the Australian Institute of Sport, proposed a new athlete pathway development framework: Foundations, Talent, Elite, Mastery (FTEM) (Gulbin, Croser, Morley and Weissensteiner 2013). A further approach called the Composite Youth Development (CYD) model integrating both talent development and physical fitness perspectives, a pathway that enhances health and fitness and performance of all children and adolescents (Williams, Best, Alvar and Cronin 2014).

2.5.1. Bloom's (1985) Model of Talent Development

Bloom (1985) spent four years studying the career development of 120 talented athletes, artists, musicians, and scientists. The study defined what Bloom (1985) considered to be the key principles by which Olympic swimmers, world-class tennis players, and concert pianists became exceptional performers in their chosen domain. One of the most important areas within talent development involves the commitment to years of learning through the quantity of practice and quality of training. Children are at the centre of this process, being supported and instructed by parents, teachers and coaches. Bloom (1985) suggests champions are not born but are a combination of natural 'God-given talent' and effective nurturing of that talent. Gifted individuals will not achieve excellence in any particular field unless they are prepared to go through a long and intensive process of development. Bloom (1985) constructed three stages of talent development:

1. Early stage initiation:

Bloom (1985) found that children tend to begin participating in sport for fun and enjoyment, which stimulates lasting excitement and interest. The coach's role at this stage is one of guidance and support with technical expertise being of a lower priority, with more emphasis placed on creating pleasurable experiences to develop long-term engagement in sport. Parents shape their children by encouraging participation in particular sports and their influence on children is at its greatest at this stage of development. Parental interest is vital in motivating children to sustain participation through these early stages. Often parents may be actively involved in coaching and instructing participants during this phase.

2. Middle stage developments:

Bloom (1985) discovered that participants move into a second stage of development that he termed "the middle stage", as they become more committed and serious, demonstrating higher levels of discipline and focus on achieving specific goals in their chosen sport. At this stage coaches are required to have higher technical skill and knowledge of the sport. The role of the parents shifts from being a motivator to an enabler, through the commitment of more financial support, time and travel to help their children make faster progress in their chosen activity.

3. Last stage perfection:

According to his study, Bloom (1985) considered the last stage of development as "perfection". During this stage the participant develops into an expert performer and sport dominates the lives of athletes. Participants take personal responsibility for results; becoming more independent and willing to dedicate time and effort to the chosen domain. Bloom (1985) defined the coach's role as more of a master or mentor at this stage, whilst parents provide emotional support.

According to Wolstencroft (2002), there are two major limitations with Bloom's (1985) model. Firstly, the model has been developed through investigation within a North American structure that is reliant on the collegiate system to develop talent. This is very different to the approach of talent development systems operating in other countries such as the UK and China. Secondly, Bloom's (1985) model is based on tennis and swimming, could this model be applied to other sports? For example, in badminton there are critical age related targets. Bloom's (1985) model makes no reference to age. In golf it is possible for a player to take up the sport in their teens and become a major champion; this is not possible in a sport like badminton.

2.5.2. Cote's (1999) Model of Talent Development: Sampling, Specialising and Investment

A number of researchers (Adernethy, Cote and Backer 1999; Cote 1999) built upon Bloom's (1985) talent development model and focused in particular on family influence. According to these researchers families play a huge part in developing the talent of potential elite athletes and career development throughout their childhood and into adulthood. Cote (1999) attempted to explain how the support of family members can contribute to the development of children in sport and the important role it plays in leading to an athlete's success at each stage of the development. As a result of this research, a three-stage model was proposed (see figure 2).

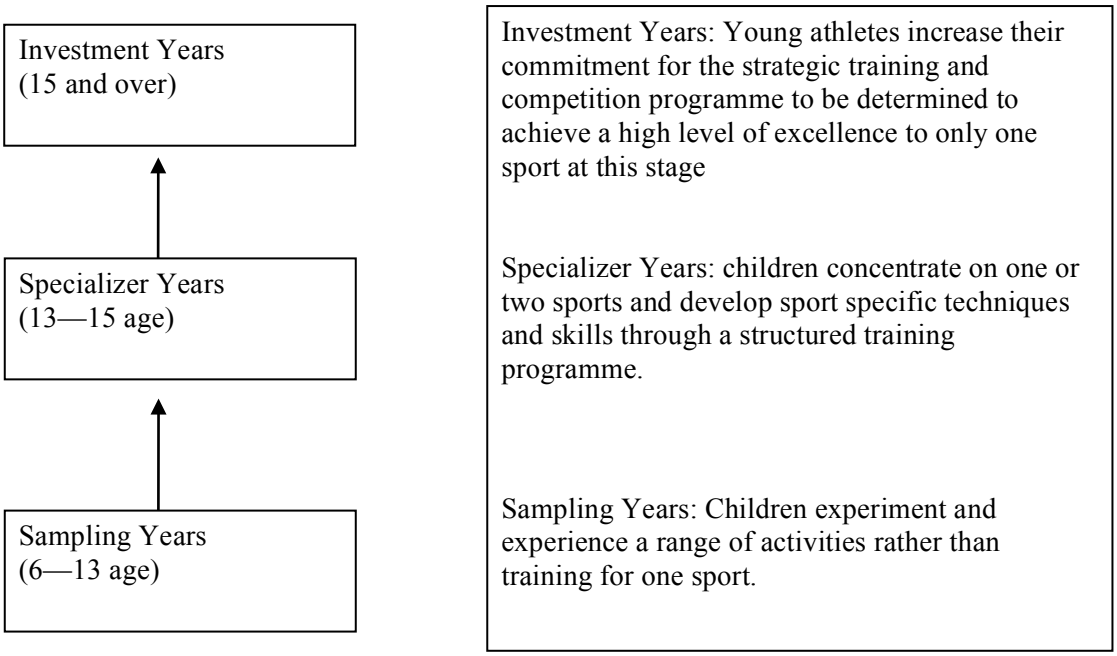


Figure 2 Development Model of Sports Participation (Cote 1999; Cote and Fraser-Thomas 2007)

1. Sampling years:

Cote's (1999) first stage was referred to as the "sampling years". This is for children involved in sport from the beginning and commonly happens between the ages of 6 to 13. During this period parents create opportunities for their children, allowing them to try a wide variety of sports. Similar to Bloom's (1995) early stage of development, the emphasis of the sampling years is placed on fun and enjoyment. Children experiment and experience a range of activities rather than training for one sport. According to Cote (1999) during the sampling years, parents recognise when their children possess something special or above average when compared to other children. These parental beliefs can lead to extra support and encouragement and act as further reinforcement for their children's determination to succeed.

2. Specialising years:

The second stage is referred to as the "specialising years". This stage refers to children aged between 13 and 15. During this stage children concentrate on one or two sports and develop sport specific techniques and skills through a structured training programme rather than solely playing for fun (Callender 2010). This stage needs both parents and children to make a commitment to one or two sports. Parents assist by giving up their social time to

transport children to training and competitions, as well as providing the financial resources for them to participate. Cote's (1999) study reported that at least one family member may already be actively involved in the sport, usually an older sibling who acts as a role model; for example, Andy Murray was influenced by his older brother, Jamie Murray, and his mother, Judy Murray.

3. Investment years:

The third stage was referred to as the "investment years" (Cote 1999). At this stage athletes are around 15 years of age and over, this varies depending on the specific requirements of the chosen sport. Young athletes show an increased commitment to one sport. According to Cote (1999), the most important component to an athletes' development is a strategic training and competition programme, coupled to development of personal characteristics needed to succeed at the highest levels in sport. Young athletes have been found to be determined to achieve a high level of excellence in one chosen sport. This requires quantity and quality of practice.

The limitation of Cote's (1999) development model is a lack of stages when the athlete reaches the upper performance levels. Durand-Bush (2000) suggested "maintenance years". He studied ten elite athletes who had won at least two gold medals at different Olympic games or world championships. Each athlete had achieved results at the highest level and at this stage of development, was expected to cope with the expectations and sustain motivation. It was often discovered that an athlete focused on small points of detail as well as a shift from a quantity of training to prioritising quality training. Durand-Bush (2000) noted the maintenance years retained a strong family influence with athletes requiring strong encouragement and support. Elite, world-level athletes often mention how the emotional support of their family was crucial to them and their success. It is clear in Cote's (1999) three-stage model the athlete's age was a determining factor in them moving to the next level. In the first stage, children aged between 6 and 13 are encouraged to try a variety of sports, however some sports require earlier or later starts. Each sport has a different period over which proficiency is gained. In some sports the development period is shorter than in others. Sports have different ages of peak performance, some arising earlier or later than others. There are limitations with these models, for example in badminton children between 6 and 13 will be learning fundamental skills and basic techniques, whereas in a

sport like gymnastics a 13-year-old will be much closer to peak performance age and the nature; volume and intensity of training will reflect this (Wang and Cheng 1995).

2.5.3. Balyi's (1999) Long-term Athlete Development (LTAD)

An additional limitation with Cote's (1999) three stage development model is when his sampling model is examined, namely starting with 6 to 13 year olds. This is later than Balyi (1999), who put forward a long-term athlete development model divided into seven stages; "active start" for those aged under six, "fundamental stage" for females between 6-8 and males 6-9, "learning to train" stage for females aged 8-11 and males 9-12, "training to train" age for females aged 11-15 and males 12-16, "training to compete" stage for females aged 15-21+/- and males 16-23+/-, "training to win stage" for females aged 18+/- and males 19+/-, with the last stage being, "active for life" which suits any age.

Ideally, the LTAD model seeks to introduce individuals to sport and gradually increase the commitment to a specific sport as athlete's progress through the various stages. Although attempts are made to recognise differences in chronological and biological development rates, broadly speaking the LTAD structure and expressions seem smooth, progressive and perfect. Smith (2003) indicated the theory should be deliberate addition on monitoring and testing systems to examine the characteristics and psychological features showing the wide range of current and potential performance. This would help the coach to constantly make judgments and recognise differences in the athlete's training.

Ultimately the chronological age of peak performance will differ from sport to sport. Most athletes enjoy their greatest achievements after they have reached athletic maturation (Bompa, 1994). In sports like gymnastics, swimming, and tennis athletes top-level performance may be realised in their early twenties and even late teens, particularly for females. For example, the 2012 Olympics swimming produced three gold medallists at the ages of 16, 17 and 18. Similarly in badminton, the women's singles gold medal was won by a 21-year-old and the average age of medallists in the women's singles was just 22.3. If the LTAD model produces excellence between the ages of 23 and 29 this might be too late for some sports and certain disciplines.

If the LTAD model is connected with Ericsson's (1993) ten-year rule or 10,000 hours of deliberate practice, then perhaps for badminton the LTAD model needs to be brought forward in order to reach mastery and stabilisation of high performance at an age which can shortly after lead to medal winning performances. Alternatively it might be important to consider that some countries do not follow this theory of talent development. China's Li Xuerui was the London 2012 Badminton Women's Singles gold medal winner at just 21 years old; she came through a Chinese developmental system which favours a talent development approach more akin with early specialisation rather than LTAD and lifelong participation. Ultimately, long-term plans should be individually tailored rather than a one size fits all approach. Plans should reflect improvement rates and progression along the performance pathway.

Perhaps the models considered provide a framework for governing bodies of sport to use as a benchmark for core development. Over the last decade governing bodies from many countries have adopted Balyi's (1999) LTAD model, including the UK, Bahrain, Canada, Austria, and Spain.

2.5.4. The Foundations, Talent, Elite, and Mastery and The Composite Youth Development Models

The FTEM (Foundations, Talent, Elite, and Mastery) model states that there are four stages of development of sport participants, with a further ten sub-phases (Figure 3). These are Foundations (F1, F2 and F3); Talent (T1, T2, T3, and T4); Elite (E1 and E2), and Mastery (M) (Gulbin, Croser, Morley, and Weissensteiner 2013). The FTEM model presents the sports development pathway as composed of discrete and distinct stages, even categorizing elite athletes. The FTEM framework however lacks detail as to who should deliver the teaching and/or coaching at which stage through the development pathway. For example, at what stage would it be appropriate for a Physical Education teacher or volunteer to be involved and at which stage would it be more applicable for specialist sports coaches at a local or national level to be involved? The framework also has limitations in respect to the amount and intensity of activity training that should be used for children or athletes at each of its designated stages.

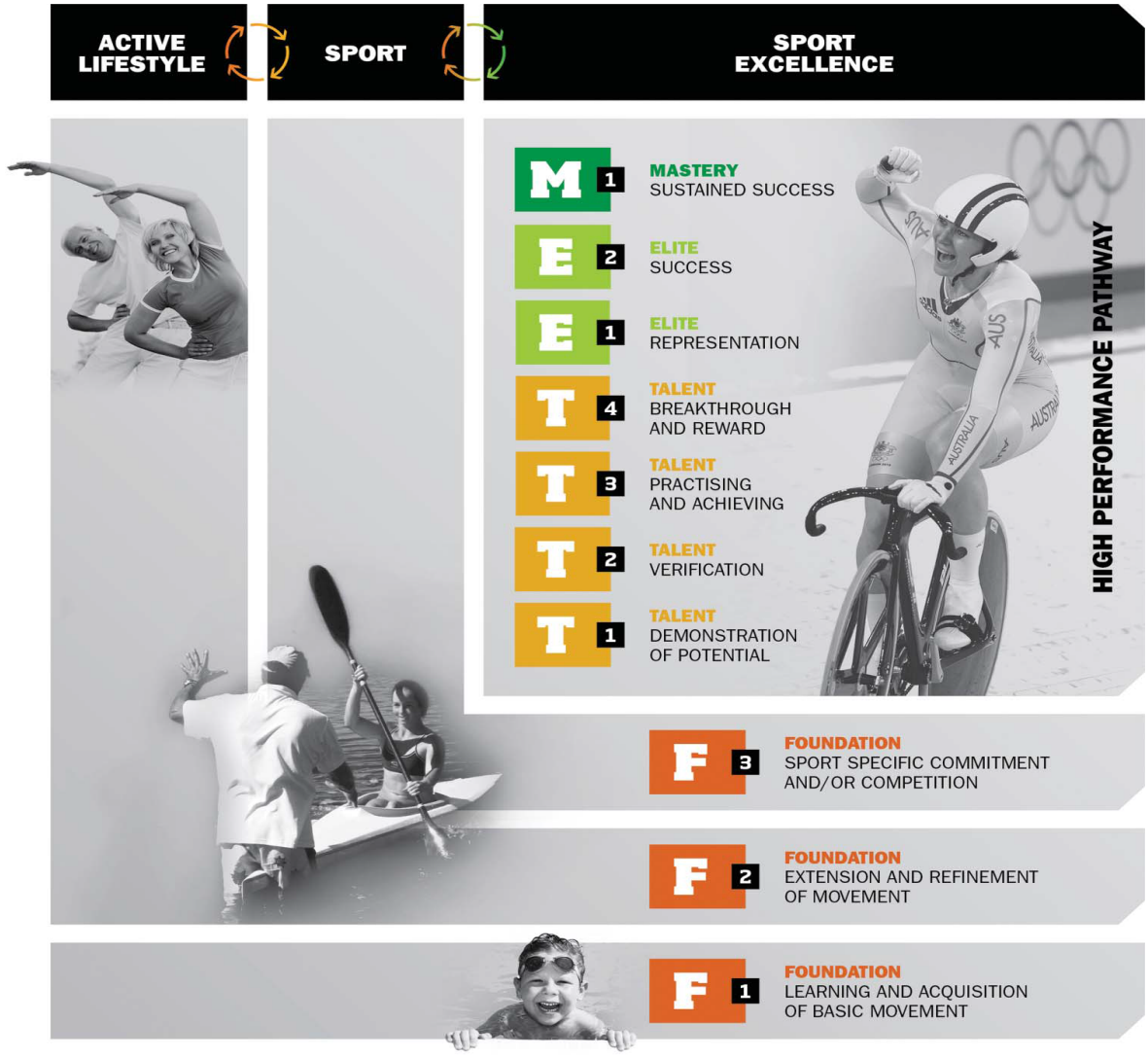


Figure 3 The Integrated FTEM framework for the optimization of sport and athlete's development (Gulbin et al, 2013)

Similar to the FTEM framework, the Composite Youth Development (CYD) model has been brought to the fore in recent years (Williams, Best, Alvar, and Cronin 2014).

The CYD model has provided the framework for progression for young athletes as it integrates both physical development and talent development. From early childhood through middle childhood to adolescence, the structured framework helps coaches or national sports bodies recognise and maximise the athletic potential of those participating in the development programme. Both the FTEM and CYD models mentioned consider themselves to be a flexible context within which there are variable entry and exit points to ensure youths are provided with individual development programmes that can lead to a

high performance pathway or a lifetime engagement with some form of sports activity (Gulbin *et al.* 2013; Williams *et al.* 2014). The CYD model looks to ensure that practitioners must motivate all youths so they have a lifetime in sports or another form of engagement with physical activity (Williams *et al.* 2014). Both the FTEM and the CYD framework aim to avoid early specialisation in a single sport to reduce the risk of injury or an early dropout rate. The CYD model rather focuses on physical development, maturation, and psychosocial development. This precludes some sports, for example gymnastics and diving, that require early specialisation as a necessary component to being successful at an international level (Baker *et al.* 2009, p.1323).

2.6. Summary

This review of literature has attempted to define and provide interpretations to the terms 'gifted' and 'talented'. In short, gifts are believed to be 'God-given', innate, genetic characteristics that can predispose individuals to certain activities. For example, anthropometric measurements such as height can be advantageous in sports like basketball and volleyball, but disadvantageous in sports like gymnastics and weightlifting, whereas talent is more related to levels of performance, which are heavily influenced by exposure to quality and quantity of training and competitive opportunity.

Alabin, Nischt, and Jefimov (1980) and Hahn (1990) have all stated that international competition is becoming increasingly dynamic with the top performing athletes being increasingly younger individuals. As has been illustrated, there have been several studies in the field of talent identification and its importance to modern sports performance development (Pienaar, Spamer, and Steyn 1998). TI has also been used to direct talented children towards recognising their full potential (Wang *et al.* 2005). Talent Identification (TI) programmes guide children towards specific sports to which they are both physically and psychologically suited.

Table 3. Summary a review of existing athlete development models

Model/Construct	Theory Orientation	Main philosophy	Advantages	Limitations
Stages of Talent Development (Bloom 1985)	Three stages: *Initiation, Development, Perfection.*	A long and intensive process of development is necessary to achieve elite level.	Family heavy involvement through development stage; introducing a sport, or commitment support, financial support and motivation.	One path way provides a broad stage of development. Features distinct depth of different sport is questionable.
Deliberate Practice (Ericsson, Krampe and Tesch-Romer 1993)	The 10-year rule or 10,000 hours of deliberate practice is required to gain mastery in any field.	Qualitative and quantitative practice.	Focused on investing and developing one activity.	Isolated from other activities. Lack of motivation. Few sports do not require that length of time to develop the athlete to the master level.
Early specialization in Youth Sport (Baker 2003)	Young children to specialize in a single sport at an early age.	Early engagement in one activity, combination of deliberate practice to develop talent.	Gain elite level success early age. "Wining at start line"	Reduced enjoyment, reduced physical health.
Development Model of Sports Participation (Cote 1999; Cote and Fraser-Thomas 2007)	Four phases of development; *Sampling Years* (6-12yrs), *Specializing Years* (13-15yrs), *Investment phase, Perfection phase.*	Presents a broad stage of development. Youth should experience a wide range of sports. Specialization and investment in the later years.	Youths try a range of sports, supports specialization for those aged 13+. Enhances physical health for youths to develop to a sport's elite level.	Lack of athletes that reach performance level, no operational or differentiation. It is questionable how many sports benefit from the 13+ age specialization.
Long Term Athlete Development (Balyi and Hamilton 2004)	Seven stages of development: *Active Start, Fundamental Stage, Learning to Train, Train to Train, Train to Compete, Train to Win, Active for Life.*	Presents a consistence pathway, from early engagement in activity and engaged with deliberate practice to developing talent to the elite level. Guides age groups with appropriate involvements at each stage.	Enhances physical health for youths to develop to a sport's elite level.	Limits adaption to a broad range of sports. For example, some sports require development at an early age. Also limits development of biological and physiological differentials in youths.
The Foundations ,Talent, Elite, Mastery Framework (Gulbin, Croser, Morley, and Weissensteiner 2013)	A framework of four stages with ten mini phases; *Foundation Talent, Elite, Mastery.*	The FTEM model presents the sports pathway with distinct stages, categorized for elite athletes, in comparison with active lifestyle, sport and high performance sport.	Enhances physical health. The pathway is applied at the individual transition or leapfrogs a number of phases.	Lack of demonstrated applications on each specific FTEM level. For example, which phases do national or club coaches, teachers, or volunteers apply to?
The Composite Youth Development Model (Williams, Best, Alvar and Cronin 2014)	Three stages for physical development; *Early Childhood, Middle Childhood, adolescence.*	Combined physical development and talent development. Provided fitness components are trainable at three stages.	Enhances physical health. Focuses on developing physical engagement with individual growth, reduces injuries and encourages lifetime engagement with sport activities.	Lack of guidance or evidence practical for development to elite level.

To date, many academic papers have proposed models of sport development or talent athlete development (Table 3). TI models help guide and develop the sport in the right direction. However, Each sport needs to understand various aspects which contribute towards performance and the methods used to develop each area. A structured systematic model could be considered more likely to achieve success. Therefore, it is valuable to consider focusing the models on a single sport, such as badminton. There has been no specific study in talent identification and development for badminton. It is worth comparing the respective systems of China, in Asia, with the UK, a European country with a different attitude towards high performance sport. Ultimately both of these countries compete in the same arena. It is therefore valuable to identify the differences and similarities in terms of talent identify and development.

This research will look to identify the similarities and differences in TI and TD in badminton in China and the UK and therefore answer the following questions:

1) Explore both countries high performance badminton programmes structure and system. What impact do these have on individual athletes?
2) A comparison between the two countries high performance badminton programme development in terms of the age players specialise in badminton training and the number of hours they train.
3) What common elements, if any, exist in world class badminton? Can these be identified in children? Discover the extent of TI progress between the two countries.

3. Methodology

3.1. Research Methodology and Goals

The research was designed in order to understand the differences between the badminton development systems of the two countries, including their respective strengths and weaknesses. The objectives of this thesis are therefore to:

- Identify the common talents and key attributes of successful badminton players.
- Identify the similarities and differences between Chinese badminton and UK badminton.
- Explore the badminton talent identification and development strengths and weaknesses of both countries.

These objectives are supported by the findings of the primary research, taking the aims of this research into account together with the literature review. The literature review identified some areas that should be examined in the research:

- What does it take to be a top international badminton athlete? What common characteristics do they have?
- The progress of TI in both countries.
- How, if at all, gifted and talented individuals can be identified, with a higher probability of successful outcomes.
- How both countries' structures and systems impact on individual players.

The research involved understanding the two countries' high-performance badminton development progress and explored certain talent characteristics desirable for top badminton athletes. It quantified the number of respondents from Chinese and UK badminton athletes and coaches who hold a particular attitude, and how strongly they felt about the areas they were questioned on. Overall, the study reflected the format used in the literature review in that it examined the UK and Chinese badminton development systems as separate entities, as well as examining how effective the high-performance professional badminton sport between the two countries' individuals was perceived amongst those participating in the research. The results of the research were used to determine a series of recommendations for the high-performance badminton development systems of both countries. Also identified were the talent elements present in top international badminton

athletes. The research findings could be applied to many countries' current badminton development programmes.

There are many research designs available for empirical research, for example experimental, cross-sectional, timescales, longitudinal, case study, grounded theory and ethnography (Gratton and Jones 2004). For the purposes of this research, three methodological approaches were combined: documentary research, qualitative research, and quantitative research. There were three different methods used: document content analysis, questionnaire survey, and semi-structured interviews.

3.2. Document Analysis

Document analysis is a form of qualitative study in which the gathering of information and documents are interpreted by the researcher to give opinion and content around an assessment of their topic. This study focused on viewing existing publically available information on Chinese badminton and GB badminton, thereby allowing a comparison between both countries' sport structures, systems, programmes, and future planned documents to be made in order to extract specific pieces of information that were relevant to this research. It would answer the first question of this literature review, explore both countries' badminton programmes, structures, and systems and what impact these have on individual athletes.

The first stage was a documentary analysis of the two national sports governing bodies' public records. The research collated and analysed published UK and China badminton documents. Thirteen documents relevant with TID were sourced from the Internet, and research also included emails to both countries' badminton federations to get relevant documents (see table 4). Research trips were also made to the badminton federations in order to collect documents when these had not been published. This is the only way to not miss any important detail about TID in both countries. Documentary analysis retrieved publications from the national sport governing bodies: UK Sport, China Sport as well relevant talent development publications in badminton. The research areas included their structure and strategy plans, their future plans and their periodicals. Some articles come from well-established available journals, while some others have had only limited circulation. In order to investigate and provide a detailed description of the documentary

evidence concerning badminton TID systems and structures in China and the UK, the research collects a broad range of relevant documents then through analysis condensed these and drew conclusions. The investigation covers TI progress development, structure, future plans, and the systems from grassroots to elite level. Both countries are compared to present their similarities and differences, as well as to consider endogenous and exogenous factors.

Access/ Place	Contact record and Date	Sources of Documents
Visit Badminton England. Published web, internal documents.	Emailed the head coach to arrange a visit to badminton England training centre, Milton Keynes.	Badminton England 2009, Performance Pathway Documents
Yonex All England Badminton Championships, Coaches Conference	Attended the coaching conference at All England. 03. 2009	Badminton England Regional Plan 2009 – 2013
Yonex All England Badminton Championships, Coaches Conference	Invited to attend the coaching conference at All England. 03.2010	Legacy Development Programme 2009-2013
Yonex All England Badminton Championships, Coaches Conference	Attended coaching conference at All England. 03. 2011	GB Badminton Annual Action Plan 2011
Sport Scotland Institute of Sport	Gain information from SIS office, Stirling. 01. 2010	Sport Scotland Institute of Sport Talent Strategy 2009-2016
Badminton Scotland, Office at Glasgow	Glasgow office, and Badminton Academy Scotstoun.	Sport Scotland Player Improvement—A consultation paper on the introduction of a long-term Player Development pathway, and its implications for strengthening the infrastructure of Scottish sport. 2006
China Badminton Association, Beijing	National Badminton Junior Camp 2014 (visited training camp at He Fei in July 2013)	China sports coaching post training teaching material Badminton. (Wang, Sheng 1995)
Sport University of Wuhan, China	Contacted lecture Liuo, visited university sport science department 01/2012	China Talent Identification Theory and Methods (Wang, Feng, 2005)
China Badminton Association, Beijing	Emailed and called the head coach Li, visited association in 01/2012	Chinese Badminton Athlete review for Talent Selection (Zheng 2005)
School of sport, Hubei province.	Contacted school coach, visited the school in 3/2013	School of Sport Beginning Selection for Badminton Athlete (Jian 2008)
The International Journal of the History of Sport,	(Hong, Wu, Xing 2005) Stirling web library.	Beijing ambitions: An analysis of the Chinese elite sports system and its Olympic strategy for the 2008 Olympic Games
Physical culture and sports commission of the people's republic of China	Contacted the head coach Han at Hubei province sport centre, visited the centre in 02/2013	School of sport badminton athlete talent identification (Jian, 2008)
China Academic Journal Electronic Publishing House.	National Badminton Junior Camp 2014 (visited the training camp He Fei in July 2013)	Badminton athlete selection view of China (Lin 2005)

Table 3 Document Sources

3.3. Athlete Questionnaire

Questionnaires are the most frequently used method to gather specific data and conduct sample findings that may be applied to the population in general. Questionnaire survey research is defined as gaining information in a systematic way from individuals in a sample that describes the attributes and relationships of the larger population of which the assessed individual are members (Smith 2010).

To define the participants for this research is a key task. Vaeyens, Gullich, Warr and Philippaerts (2009) highlighted the TID leading or related to the high performance programme. All participants must in high performance programme. The questionnaires were only handed out to Chinese and British national badminton players. Data was collected through questionnaires and the findings were cross-tabulated as UK or Chinese badminton individuals. This questionnaire reflected an extensive literature review, and the data it produced allowed comparison of the development pathways of the two countries' athletes, permitted exploration of the TI test in both countries, and also identified the key attributes of successful badminton players.

The questionnaire was developed in four sections: The first section was to find out the backgrounds of both countries' athletes. For example, age, employment, world ranking, how long have they trained at badminton, and when did there specialization in badminton begin. The second section was to understand player development, for example, age compared to number of hours training, and which talent tests they had done. The third section was to explore what type of TI test the athletes had done. The fourth section was to understand player's view on Talent Identification and what attributes are important for the player. The survey questionnaire (Appendix IV) collected demographic data, and some questions were used to gather data on the respondents' gender, age, sports background and opinion on TI in badminton.

The questionnaire was designed for badminton players only to identify the major key factors to understand badminton player's development process, emotions and how talent impacts on personal success. The responses would be presented to current international badminton players in the UK and China. Questions 1 to 6 were used to identify both country players' statuses. This portion of the questionnaire used closed questions and pre-coded questions. Gratton and Jones (2004) stated the guidelines for using closed questions

are: where quantitative data is required from the participant's responses, where the interviewer has a clear idea of the likely responses, and where respondent's answers are to be used for a predetermined set of responses. Questions 7 to 35 were used to find out both countries players' views on development; their similarities and differences. Some questions were closed and pre-coded, and some questions also used the concept of scaling techniques. Questions 36 to 93 were used to discover players' opinions on the importance on TI. These questions used a semantic differential approach as it allows a structured questionnaire to be used but gives respondents rather more freedom in expressing their views than restricting them to simple "Very important / very unimportant". A "five-item scale" was used. This format allowed respondents to have the option of ticking one of five possible boxes. The questions were designed to gain data such as opinions on something or an attitude towards something (Smith 2010).

The quantitative questionnaire survey was designed for a sample group to relatively simple measurements. The process was initiated by drafting information from a wide ranging review of literature in the area of badminton talent development. It was based on gathering demographic data on both national team athletes. The respondents were identified in the major championships as participating athletes in the competition. The reason for these championships being chosen to apply the quantitative questionnaire survey was that it brought accessibility to all the candidates and obtained data from a focused specialist population. This route was also chosen as it would negate any cost that would be incurred and would be carried out within anticipated timescales required for the completion of this study. To maximize the response rate, participants were identified at the same areas or events, and a researcher asked questions face to face (Gratton and Jones 2004).

A cover letter for the questionnaire was included. Therefore information and explanation of this questionnaire and this research was given to the participants, and they were also instructed on how to compete the questionnaire (Appendix III).

The data obtained from the survey questionnaire was analysed using a package SPSS (Statistical Package for the Social Sciences for Windows) and the Chi-squared test. The first stage in analysing the data is to facilitate the data or a sequential arithmetic serial number for input into SPSS. The data was applied to the questionnaires that were returned based on the order they were received back. To allow interpretation of statistical results

there are several steps that need to be undertaken before going through the process of analysis (Gratton and Jones 2004):

- ***Coding data***, for example in appendix questionnaire for players the 1st and 3rd questions on gender and nationality. Non-numerical questions had involved answers, thus responses should be collated using numerical values. The coding translated the responses into common categories by assigning a numerical value.
- ***Data entry***. Once data entry has been completed.
- ***Data checking*** to check possible or accidental errors and to make sure of the data's accuracy.
- ***Dealing with missing values*** in general some questions were not answered, thus these should be assigned a value in the data set. This allowed the data to be divided between the actual missing values and those inadvertently omitted. Inferential statistics has been used in the process, it is allowed from wider population of samples by analysis of the differences between two countries' groups of players.

After creating the variables and entering the survey data, appropriated analyses in SPSS are completed. The results of each question was presented using a percentage to allow comparison between both countries; the Chi-squared test was chosen to test for if there is the significance difference between both countries athletes development, and athletes on talent test view.

3.4. Coach Interviews

Semi-structured interviews were adopted as they provide qualitative data and they allow the gathering of rich information from badminton experts. Qualitative research is *'*impressionistic rather than conclusive, it probes rather than counts*'* (Chisnall 1981, p. 169). In-depth interviews were carried out with particular interviewees to collect qualitative data, looking to explore their thoughts about badminton talent and badminton development, and find the otherwise hidden talents of successful top international badminton players. To discover the extent of TI progress between the two countries, the interviews related to three themes: first, coaches opinion on talent and TI. Second, athlete development (the coaches' thoughts on early specialization, 10,000-hours training, and training progress), and third was the current programme structure and limitations.

For the qualitative component of the study a semi structured interview of participants was chosen based on their background and profession. In both countries a total of eight national team coaches were selected that fulfilled the criteria: They each had a minimum of six years' coaching experience, had coached at the national level and had proven leadership in the coaching role as a profession. The reason for choosing this approach was that these coaches have the experience of coaching elite badminton players therefore they know the systems and structures under examination and have a well-developed knowledge of coaching badminton players at this level. The researcher aimed to discover the attributes required for a successful badminton player, the development of these players, and the impact of the structure and systems of both countries' methodologies. It was felt that expert coaches could give rich, complex and subjective views and in-depth opinions.

Before deciding how any empirical evidence was gathered a number of fundamental principles were established. The questions were phrased clearly and avoided words unfamiliar to those who received the questionnaire. It is important that information is clearly identified, and the questionnaire should be as short as possible (Gratton and Jones 2004). Biased questions were avoided, this meant that questions were phrased carefully in order to avoid any suggestion that certain responses would be more acceptable than others. There is no generally agreed definition of a leading question, but it can be considered as one by which 'its content, structure or wording leads respondents in the direction of a certain kind of answer' (Chisnall 1981, p.143).

In the data collection, it was deemed that manual analysis was the appropriate method for analysing the rich qualitative data. This was because there are several issues with computer software when analysing qualitative data (Smith 2010), for example, computer software analysis seems more objective, and is for routine or mechanical processes, and most software only identifies specific words within a sentence but often fails to locate the context. However, the analysis used direct quotes from interviewees, thus the raw data can enrich the report (Gratton and Jones 2004). In order to achieve the objectives the author took audio recordings of the eight interviews on the topic under investigation and transcribed these. The author followed the process described by Flick (2014), namely an approach that followed three phases: one, data reduction, two, data reorganization, and three, data representation. This is an effective way to manage difference data and

emphasizes the importance of visual displays in interpreting and representing data, for example figures (Flick 2014).

The semi-structured interview method was important for discovering the expert coaches views on talent and development in badminton. It also allowed the researcher to have deep conversations with professional individuals. This approach allows the use of open questions for the most important questions. Gratton and Jones (2004) have stated concerning open questions that they require qualitative data, complex responses, can produce unexpected responses, and highlight that respondents' words are important. The semi-structured interview method was therefore used in this research to extract the experiences and opinions from the interviewees. The qualitative data from these semi-structured interviews are provided in Appendix V.

The participants were chosen because they had many years of involvement with badminton and have a high level of knowledge within this sport. They also were identified due to working as professionals responsible for identifying and developing badminton players. In this way, the list of interviewees was established and is reproduced in Appendix VI.

3.5. Piloting

The pilot questionnaire stage demonstrated some necessary contents and identified some errors of design in order to create a final appropriate questionnaire. Two Scottish national team badminton athletes and two Chinese province team badminton athletes completed pilot questionnaires. The preliminary data from the pilot questionnaires was analysed using Microsoft Excel. This preliminary data was used to make sure that the method is fit for the research purpose. The pilot survey was carried out on a small group of Scottish national badminton players and a small group of Chinese provincial badminton players. The pilot survey illustrated a number of important roles (Gratton and Jones 2004), for example to re-check the order of priority and to be logical and clearly understandable to respondents, to estimate the completion time of the survey, and to permit the researcher to test the method of analysing the data collected from the questionnaires.

Furthermore, two pilot semi-structured interviews were carried out. Two coaches from the regional team were interviewed. The English-language face-to-face interview lasted

approximately 40 minutes and the Chinese-language interview, conducted over Internet WeChat, lasted one hour. This gave the researcher awareness of the time expectation in each interview and tested the Internet connection that would be used for some of the Chinese coaches' interviews. It also gave the researcher experience how to create a suitable environment for the interviews. Finally, it allowed the researcher to fine-tune the interview questions.

Both the pilot questionnaire and semi-structure data do not influence any of the final statistical data collection results.

3.6. Reliability and Validity

According to Gratton and Jones (2004) reliability and validity are considered essential elements in a research study, and are therefore important issues that needs be addressed. Reliability applies, for example, to interview schedules, and permission to record those interviews. Validity can be enhanced if the subject of an interview is ensured confidentiality (see Table 5 for questionnaire ethical considerations).

Ethical issue	**Questionnaire**
Access	Opportunity at international tournament, permission was granted by each individual player.
Consent	Players were asked to take part in the questionnaire at a tournament in their free time. Players knew that participation was voluntary. A cover letter was attached to the front page of the questionnaire to explain this.
Confidentiality	All questionnaire responses were anonymous. The information collected was not traced back to any individual athlete.
Dissemination	An electronic version of this dissertation will be uploaded to the University of Stirling's Library website, and so participants who may wish to can read its findings.

Table 4 Questionnaire ethical considerations

A covering letter was attached to the questionnaire during the quantitative process. The letter was to guarantee that participants were aware of my confidentiality and their

anonymity, and understood the importance of their answers to this research (Appendix III). This was to ensure that participants answered honestly, improving the validity of the responses (Smith 2010).

During the qualitative element, which used the semi-structured interview technique, interviewees were given the option of confidentiality and anonymity before the interviews took place. All the interviewees gave their permission to have thier interviews recorded, which the researcher transcribed from. At the end of the interviews, the interviewees were offered the chance to view the transcript of the interview and they were also allowed to withdraw at any time. All the participants were aware that their own personal characteristics may have implications for data collection. The study was carried out openly, and all the information for the data collection was informed and approved by the participants (see Table 6 for interview ethical considerations).

Access	Coaches were invited to participate in an interview via email and WeChat message.
Consent	It was made clear in the message that participation was voluntary. Each interviewee was asked to read the information letter and to complete a consent form (Appendix V) to state that they understood the information and were willing for the interview to be recorded. Players knew that participation was voluntary, A cover letter was attached to the front page of the questionnaire to explain this.
Confidentiality	Interviewees were able to advise me that they wanted to remain anonymous and I offered to send the respective interview transcription to the interviews. The names 'Coach A' and 'B' are used in this write up to protect the anonymity of the two interviewees. The rest of the interviewees wished to be named.
Dissemination	An electronic version of this dissertation will be uploaded to the University of Stirling's Library website, and so participants who may wish to can read its findings.

Table 5 Interview ethical considerations

3.7. Final

As has been previously mentioned, this study utilised three different research methods, data from different sources, and used different data collection techniques. Combining the three approaches allowed appropriate triangulation of data. Triangulation uses multiple data sources on the same topic to focus in on and explore a single phenomenon. It allows access to a variety of opportunities to disclose several different aspects of a particular subject to gain an understanding of the phenomenon (Flick 2014). The issue of combining methods needs to be prudent in identifying the study's purpose when using a mix of data. To allow this to happen, the two or three types of data should complement each other; for example one should describe the phenomenon, and another should help to gain understanding of the phenomenon (Gratton and Jones 2004).

This research can be considered to be ethnographic. Ethnographic research is a comparison of groups that are involved in activities during a similar event in the context of everyday life (Flick 2015). However, this research first and foremost takes a comparative approach. It follows the same study areas as defined by Flick (2014), who identified five areas in a comparison study: one, identify the appearance and nonappearance of a single phenomenon in the accounts of different groups. Two, discover how the principle of the phenomenon varies between groups. Three, discover what reasons and explanations lie behind the phenomenon and different impacts between the different groups. Four, discover the interactions affecting the phenomenon in different settings. Five, discover the wider differences of the research issues as they are experienced by the different groups. Therefore this research adopted questionnaire surveys and semi-structured interviews based on the core focus of people's opinions and beliefs on what and how TID impact differed on individual players in China and the UK.

4. A Comparison of Badminton in China and the UK

This chapter will present the analysis of a wide range of documents that concern themselves with an examination of sporting structures and sporting systems as they apply to the high-performance badminton programmes in China and the UK. This is with a view to discovering what the similarities and differences are between the two country's systems (see table 7)**.**

Objectives	• Explore both countries' high-performance badminton programme TI, TD, structure, and system. • Compare the differences and similarities.
Background	• Relies on specific research on both countries' strategic plans for information gathering and evaluation. • Quantitative and qualitative research on specific documents.
Methods	• Identified relevant sources. Identified key themes, generated a concept in each document. • Generated coded tables for each document. Manual and computer assisted analyses.
Result	• Both countries have some similarities but more differences; there are strengths and weaknesses in both countries' approaches. See table 8, p66.
Discussion	• Structure: single route in China, multiple routes in the UK. • Talent in Badminton: innate ability, skill development. • TI in badminton: physical approach in the UK, scientific approach in China. • Development: children rely on parents at initial stage in the UK, full funding for selected children in China. • System: natural progression in the UK. Filter system.

Table 6 Documents Analysis

4.1. TD: Model of Systematic and Asystematic Structure in China and the UK

This section will investigate these two models and look at the positive and negative aspects of these models in the UK and China. Fisher and Borms (1990) identified two approaches to talent development: 'systematic and asystematic'. Asystematic highlights how social and family influences are critical in the sport development pathway. It appears that this approach to TD operates in the UK (Wolstencroft 2002). Farrow, Baker and MacMahon (2008) highlighted that in the UK there was not one single pathway approach to excellence within sport. Wolstencroft (2002) and Falk, Lidor, Lander and Lang (2004) refer to multiple routes to high performance and that British athletes could follow a number of different developmental pathways to reach an elite level.

The UK has a distinctive structure in that it is comprised of four separate home nations: England, Scotland, Wales and Northern Ireland. In some events they combine together to compete as Great Britain and Northern Ireland, for example, the Olympics, whilst in other sports and games they compete as separate countries, for example, the Commonwealth Games. Many sports offer competitions for the home nations and the UK. As such there needs to be a unified effort amongst sometimes separate and competitive rival organisations. In the UK there are four sports councils. Each sports council is responsible for the development of sport, including grass roots participation, coach education, and volunteering. The purpose of this is to provide opportunities for many and encourage participation in sport, particularly amongst young people. This is important in terms of generating a broad base of participation. It is commonly believed that a larger number of people playing the sport will provide a broader pool of talent from which to make selections. Sports Councils fund the governing bodies of sport. For example, the Scottish Sports Council, Sport Scotland, fund governing bodies of sport in Scotland for two purposes: firstly, for the broad based developmental aspects listed above and secondly, for Scottish high performance sport. Funding for elite sport is therefore slightly more complex due to the British and home nations element. This is often a challenge in itself, but is certainly noteworthy for the structure of high performance sport in the UK.

By comparison, the Chinese high performance sporting system is more mature than its British counterparts, with UK Sport only established in 1997, largely in response to Britain's lowest Olympic medal table finishing position in Atlanta 1996 and its lowest medal haul since 1952. UK Sport was given responsibility for high performance sport in

the UK with an annual budget of approximately £100 million (UK Sport 2012). Since its inception there has been a clear focus on summer and winter Olympic and Paralympic programmes. UK Sport operates a World Class Performance Programme consisting of three stages. Podium is the top level, which is designed to support athletes with realistic capabilities to win a medal at Olympic or Paralympic games, usually within four years. The second stage is known as Development. This supports athletes demonstrating potential to win medals at future major games, that is, more than four years out. The initial stage is labelled Talent. This is the start of the World Class pathway, which targets the identification and confirmation of athletes with potential to progress with focused investment. With years of experience, a 'No Compromise' approach has been developed. This means focusing resources on athletes on track to win medals. Support is directed to athletes via the governing bodies of sport. Athletes will be supported by coaching, training, and competitive opportunities, medical and scientific services and access to quality facilities. UK Sport Athlete Personal Awards direct finance to athletes on a means–tested basis to support living costs and sporting costs. This is done to enable athletes to train and compete on a full–time basis (UK Sport 2012).

UK Sport has been relatively successful, if judged by the results and medal winning performances on the international stage. The limitation of the World Class Performance Programme is that it does not provide comprehensive funding from start to podium, especially in sports like badminton, tennis, swimming, and gymnastics. Meaning, in the early stages of development, children with potential require support from their parents and family to develop, similar to Cote's (1999) model. The sports development pyramid is popular among policy makers, but the logic of the model means the quality of performers at elite levels depends upon the experiences and resources offered to those at the lowest levels. This is a weakness and major flaw in the sport development continuum illustrated in (Figure 4) as a whole.

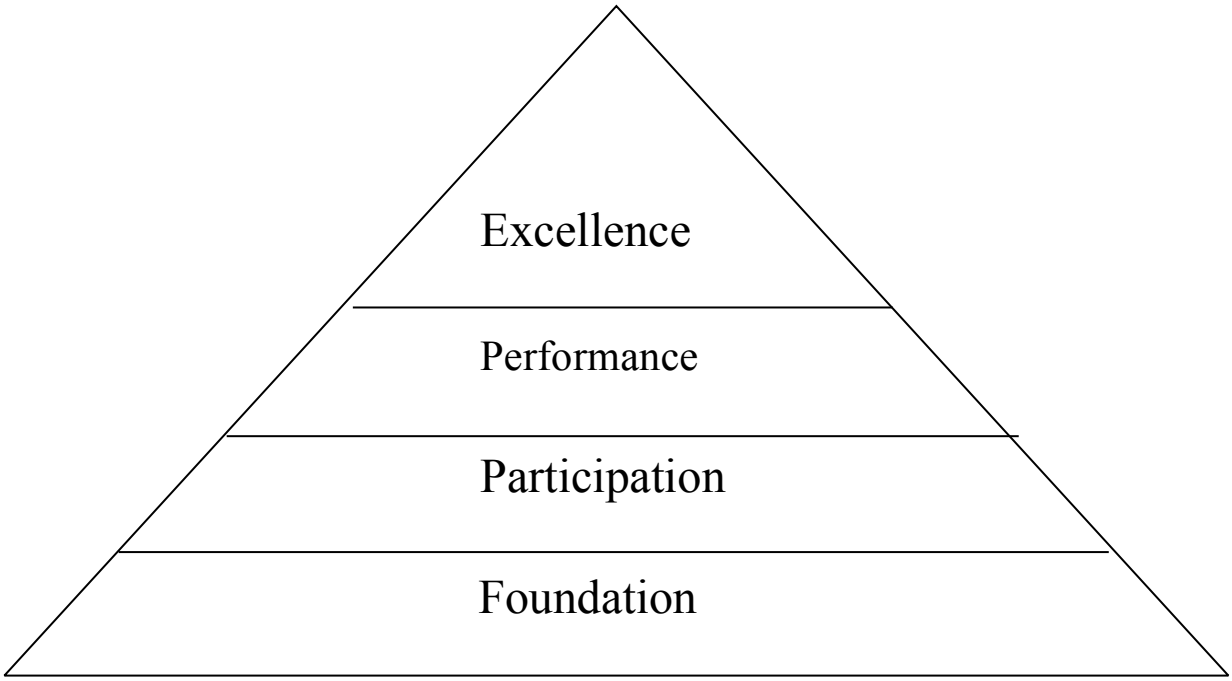


Figure 4 UK Sports Council development continuum. Sport Council (1993)

This weak foundation undermines the entire model (Bailey *et al.* 2010). Clearly the lack of resources allocated to the bottom of the pyramid favours those children from more affluent backgrounds who have the financial resources and support to participate and begin the developmental journey, or conversely the system fails to support those with the potential but without the necessary financial support. This argument is reinforced with statistics that 33% and 37% of British medal winners at the 2004 and 2008 Olympics, respectively, were educated at private schools (Smithers and Robinson 2008). Bloom (1985) and Cotes (1999) identified the important role of parents, particularly in terms of providing encouragement, financial and emotional support. Parents supporting children with potential strive for inclusion within national or British squads which can enhance further opportunities and support. For example in Scotland :

> Every Scot should have the opportunity to progress from the foundation and participation levels in sport through performance development to the elite level of top class international sport, limited only by an individual's ambition and ability. (Scottish Sport Council, 1996)

Building on the success of Sport 21 (Executive 2007) the Scottish Government had a vision to deliver affordable, high quality sporting facilities, advice, and guidance that everyone in Scotland could access. Within this plan there was particular emphasis placed

on ensuring that these high-quality facilities were available to young people to support their training and competition entry in a bid to help them fulfil their potential.

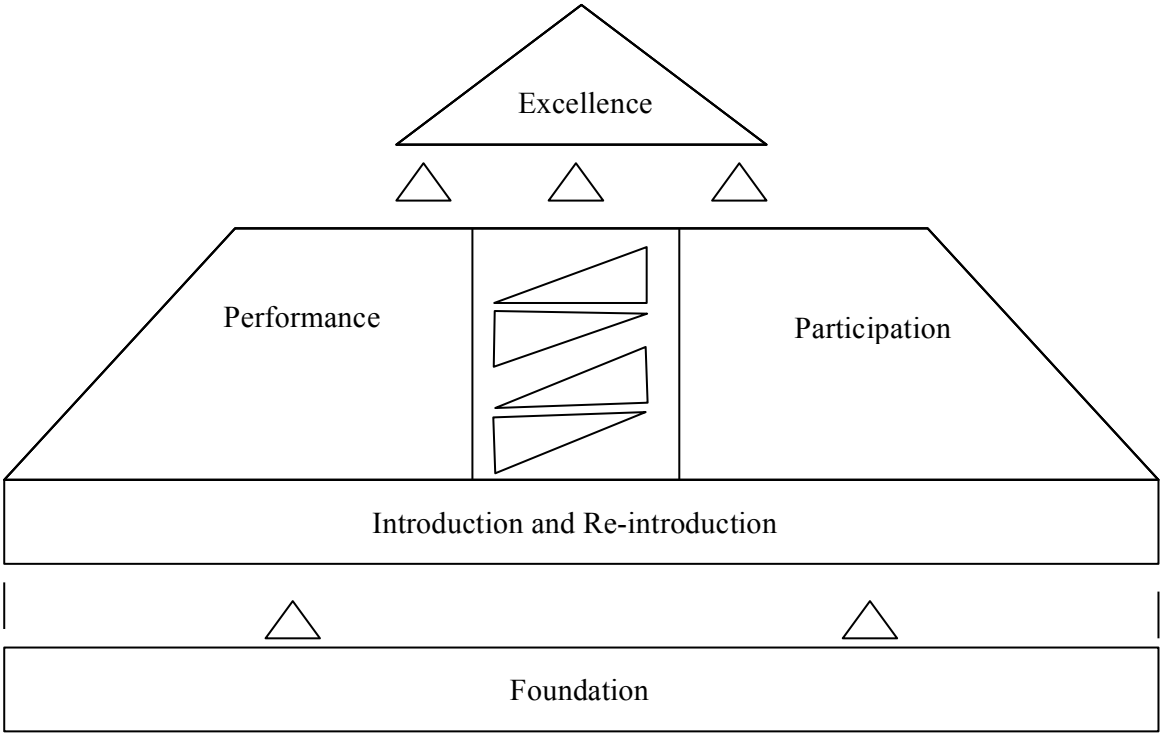


Figure 5 The sports development continuum. (Randak, 1998)

Figure 5 shows the Talent Identification Development structure and the principle approach is for natural progression and development rather than enforcing a particular development pathway too early (Randak, 1998). The model is based on a common sport structure that distinguishes itself from staged progression talent development models. It is based on the premise that the child's family from the beginning of their development supports the finances and management for sport facilities. It does not address the situation where a child has sporting potential but their family cannot afford access to necessary sporting provision. This approach runs contrary to the Scottish Sports Council's (1996) initiative of performance sports opportunity for all, although even that system had restrictions and the budget has come under threat from central funding cut backs. More recently Sports Scotland in their document, *"*Building a world class sporting system for everyone in Scotland*"* (Raising the Bar; Corporate Plan 2015-2019), expanded on the Scottish Government publication; however they highlighted that building this type of sport system would require thousands of volunteers that in turn could mean that the overall quality of coaching may not be that high or consistent.

Chinese sport development systems and structures differ considerably from the UK. The Chinese Government forms the main core of support for talent development in sport. This involves exposing athletes to suitable facilities, coaching, training, competition, sports science, and sports medicine at an early age. The Chinese have a systematic development path that is applied for all sports. China where there are 32 programmes within the provinces or cities which run high performance badminton programmes to support the national programme, all performance sport funding comes from the government (Li 2007). This is different to the UK with its natural progression system meaning there is a heavy reliance on family support. Houlihan and Green (2005) stated that successful elite sports development requires co-operation between government and the national governing bodies of sport to maximise the opportunity for success from the available talent pool. Critically and interestingly higher target results and higher levels of achievement are always strongly expected from the system. The UK Sport World Class Performance Programme operates a 'no compromise' approach which demands medals in world championships and other major sporting events (UK Sport 2012). This is considered essential for high performance sport in China. The Chinese High Performance Sports Council considered the only route to achieving success is to show exemplary and consistent professional behaviour. This is reinforced by the fact that every Olympic sport has a very similar Talent Identification and Development structure. Young children that show real potential work with professional staff, coaches, sport scientists, physiotherapists, and doctors amongst others to aid their development. The Chinese sporting authorities look for a nonstop stream of talent with the continuous selection and de-selection of athletes. As athletes progress through the performance levels, the amount of de-selection decreases. The Chinese label this process, *"*Special Talent Education*"* (Houlihan and Green 2008 p. 27**)**. This process leads to a percentage of athletes being de-selected each year and there is very little in the way of exit strategies for these athletes and their future career. This aspect merits further consideration and investigation. This is something the western countries are very aware of with the UK Sport Performance Lifestyle team being an obvious example of trying to support, educate, and prepare athletes for a life and a career after professional sport, as well as the fundamental ethos of the sport development continuum in terms of generating life-long engagement in sport.

The Chinese high performance development approach follows a systematic model which seems to be oppressive from the start, with higher results-based demands being placed from an earlier stage of development. In comparison, the UK high performance development structure is asystematic and viewed as a more natural process from the beginning until the latter stages and pursuit of excellence on the world stage.

4.2. Talent in Badminton

Badminton is a high-skill "open" or "combat" sport, which requires spatial awareness and constant decision-making, as well as a broad range of physical, psychological, and technical abilities (Jian 2008). As mentioned previously, talent refers to an individual's ability to perform to their maximum potential and deliver optimal performance in a given sport (Coldey, Fraser-Thomas and Baker 2009). Therefore each sport needs to consider its individual requirements to deliver that optimal performance. These elements that constitute talent in badminton are very hard to specify.

Governing bodies like Badminton Scotland (2009), Badminton England (2007), Badminton Ireland (2010) and Badminton Australia (2008) commonly cited talent indicators in badminton as: anthropometry, physical, physiological characteristics, technical and tactical skills. These bodies have set criteria for each factor against which perspective athletes are tested in respective talent identification programmes. China has a different view on talent in badminton. Wang *et al.* (2005) highlighted several factors of talent in badminton, which could be classed as intangible. This mentions that the technical and tactical skills in badminton are both subjective and objective. Some of these can be displayed in matches. For example, an athlete able to use the tactical side well to maximise his or her technical abilities in the games, as opposed to athletes who consistently train very well, but do not produce all of these qualities in games. Some athletes respond more positively to coaching than others, being able to adjust well in different situations. Some players are better equipped to perform on the big occasion of a championship. Moreover, talent could include attitudinal qualities, such as the intrinsic motivation to fulfil potential. The question being, is this natural or is this learned and developed?

Zheng (2005) deemed an individual's innate attitude as a fundamental determinant in the likelihood to fulfil potential. Zheng (2005) used a computer analogy when looking at an

athlete's talent attributes, which considered innate genetic aptitude as being like computer hardware, while environmental factors are added later as software would be to computer hardware. If a 'computer' (in this case the athlete) has well-developed hardware it is easier to make that athlete a better performer in future by adding the, 'software' of development later. No consensus of opinion can be drawn from the literature on what constitutes talent in badminton and furthermore what are the advantageous characteristics to look for when identifying talent. There is debate over which factors can be developed and there is no agreement over which characteristics are limited despite developmental intentions. As there is a degree of ambiguity, it is an area befitting of further investigation on dimensions or measurements of the talent components in badminton.

4.2.1. Talent Identified in Badminton in China and the UK

The UK is separated into four national governing bodies. In recent years each governing body has been searching for young domestic talent or future star (Badminton Scotland, 2009; Badminton England, 2007; Ulster Badminton--Badminton in Northern Ireland Badminton Ireland, 2010; Badminton Wales, 2010). The search is based on testing young children in the following areas: power, strength, speed, endurance, agility, co-ordination, flexibility, reaction time, balance, body shape and mental toughness (Scottish National Development U12 TID 2010; Badminton England 2009). The tests require young children to have fast reactions, speed of decision-making in such things as starting to move, stopping, changing direction and explosive power and co-ordination. The criteria of selection for the talented child suggests physical characteristics are a priority in particular, with desired traits being athletic build, speed and power. Technical and tactical qualities come second, meaning players should be able to display a good level of racket skill, an ability to read the game well and change tactics effectively. Third is mentality; the player needs to be able to concentrate in training and demonstrate mental toughness in the competitive arena. Fourth is attitude; the child should display a high level of commitment in any training session and a positive attitude to all competitions and be proactive in their own individual training, as well as taking responsibility for leading a healthy lifestyle conducive to performance sport. However, in the UK the final decision in terms of these tests is based on the coaches' recommendations (Badminton Scotland, 2009; Badminton England, 2007; Badminton Ireland, 2010; Badminton Wales 2010).

The Chinese talent identification system differs from that used in the UK. Chinese Badminton talent identification programme advocates looking for children with innate qualities, for example, it considers anthropometric measurements and other physiological factors (Wang and Sheng 1995). Specifically, it refers to ideas such as predicted limb length measurements through bone scanning, aspects of body shape, height and somatotypes (upper and lower body length, shoulder and hip width measurements). It believes the thickness of the Achilles tendon and the shape of feet can place limitations on potential agility. The anthropometric profile approach considers potential performance capabilities rather than current performance levels which can be heavily influenced by environmental factors (Anita, Manie and Hendrik 1997; Amusa, Toriola and Dhaliwal 2001). Wang and Sheng (1995) believe the components of fitness identified by some countries are less important as these attributes can be developed over time.

Comparing these two approaches, there are notable issues with the British TI system in badminton. Firstly, children are tested at an older age than in China. The players that are tested in Britain are already in the system and therefore a product of their experiences as much as anything else. So potentially those who have more exposure to training, coaching, and competition are more likely to perform better. This does not necessarily mean they have more potential they are just better at that moment in time. So in short, is the test even or fair? However, in China the testing begins at a much earlier age, which reduces the likelihood of these experiential differences and is therefore by nature more likely to test the raw materials, rather than trained abilities.

Another concern with the British testing system is that it is heavily dependent on physical testing. These tests are often imprecise due to different maturation rates. Pre-maturation testing is unlikely to correlate with post-maturation results. China also takes a more scientific approach to physical testing, taking into account things like anthropometric measurements, family history and bone scanning to predict future potential, whereas the British testing focuses on different components of fitness, which the Chinese are not so concerned with as these can be trained and improved over time.

4.2.2. TD: UK Badminton Development Structure

As discussed earlier, badminton in the UK has four governing bodies, one in each home nation: BadmintonEngland, BadmintonScotland, BadmintonWales and UlsterBadmintton (Northern Ireland). Each governing body has its own representative team permitting entry to the World Badminton Federation and European Badminton Federation. The one exception is where all four nations come together to form Great Britain's entry to the Olympic Games (see Figure 6). Each of the four nations has one national training centre and performance programme with the GB badminton programme selecting players, as long as they meet the eligibility criteria, from each of the four nations. The GB national badminton training centre is based at Milton Keynes with a limit of between 20 to 30 players selected, the selection being dictated by their performance objectives and the potential for them to achieve a good result. This centralised training model is based on the selected players training at the GB national badminton centre from Level D or earlier. Development for players in the remaining levels not identified for selection at the GB national training centre will receive coaching support from their respective home country's performance networks. This includes players categorised into Podium Level A, B and C, and Development Level D, E, and F.

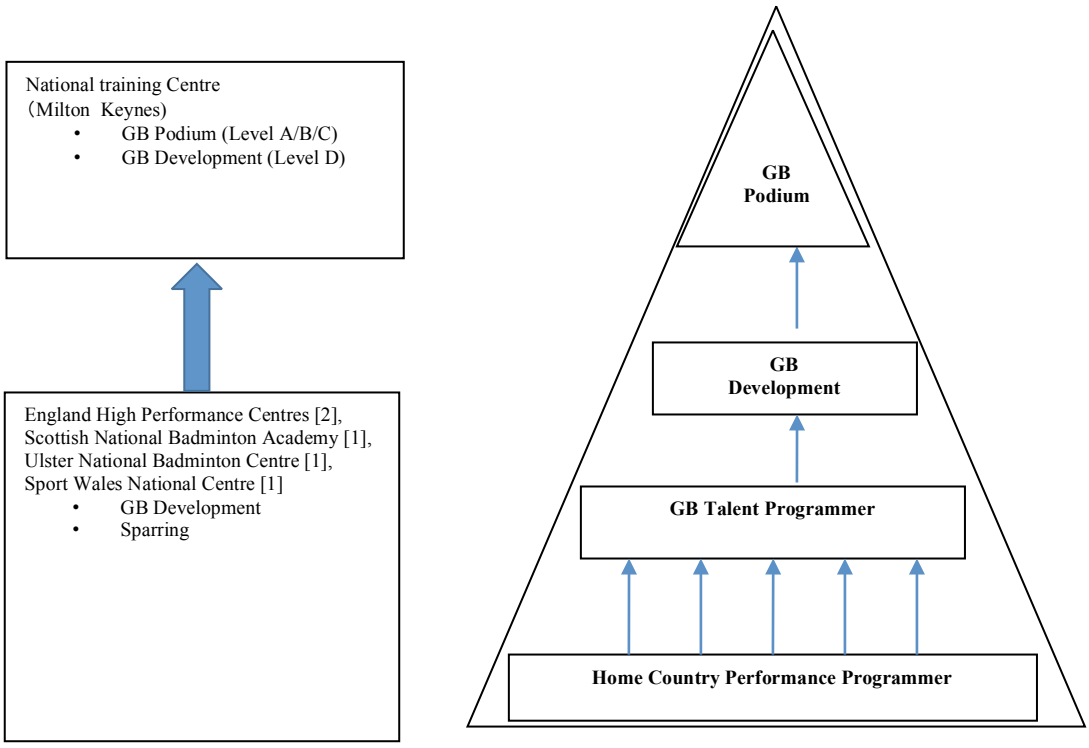


Figure 6 GB Badminton Performance Pathway (2014).

Badminton England provides a progressive pathway (see figure 7) from the community badminton network of local clubs and schools, which are open to everyone at a grassroots level. The better players feed into regional performance centres where identification, nurturing, and development of talented players can take place. Progression beyond this stage is into the England performance squad, where high-quality players are prepared for elite-level competition. Players in this squad are expected to be able to compete for Commonwealth, European, World and Olympic medals. However, the structure of the pathway lacks definitive detail of how an athlete can move from one stage to the next. There is also confusion between the England performance squad and the preparation for world-class medals (Badminton England Regional 2009-2013).

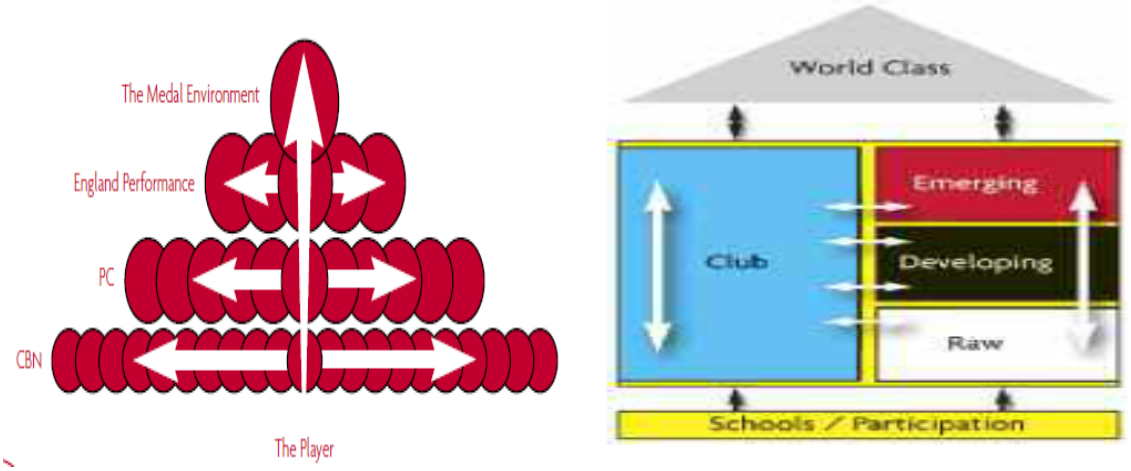


Figure 7 Badminton England Structure for Success – The Plan, *Badminton England Regional Plan 2009 – 2013*.

Badminton Scotland's performance pathway is adapted (Balyi and Hamilton 1999) to work with the long-term athlete development model (Scottish Badminton Performance Plan 2007-2014). Figure 8 illustrates the pathway with developmental progressions by age down the side. The middle of the diagram shows that the approach is deliberately structured to give an athlete a relatively free range of developmental opportunities from school, development squad, regional satellite squad, club, national level, junior national high performance squad and the national senior team. At the higher levels of the pathway there are three levels: the senior national squad supported by the SportScotland institute of sport, the GB programme, and the Olympic squad. This raises questions about the most effective

route and the best way to nurture talent. In recent years Scotland has produced a high number of players for the GB programme.

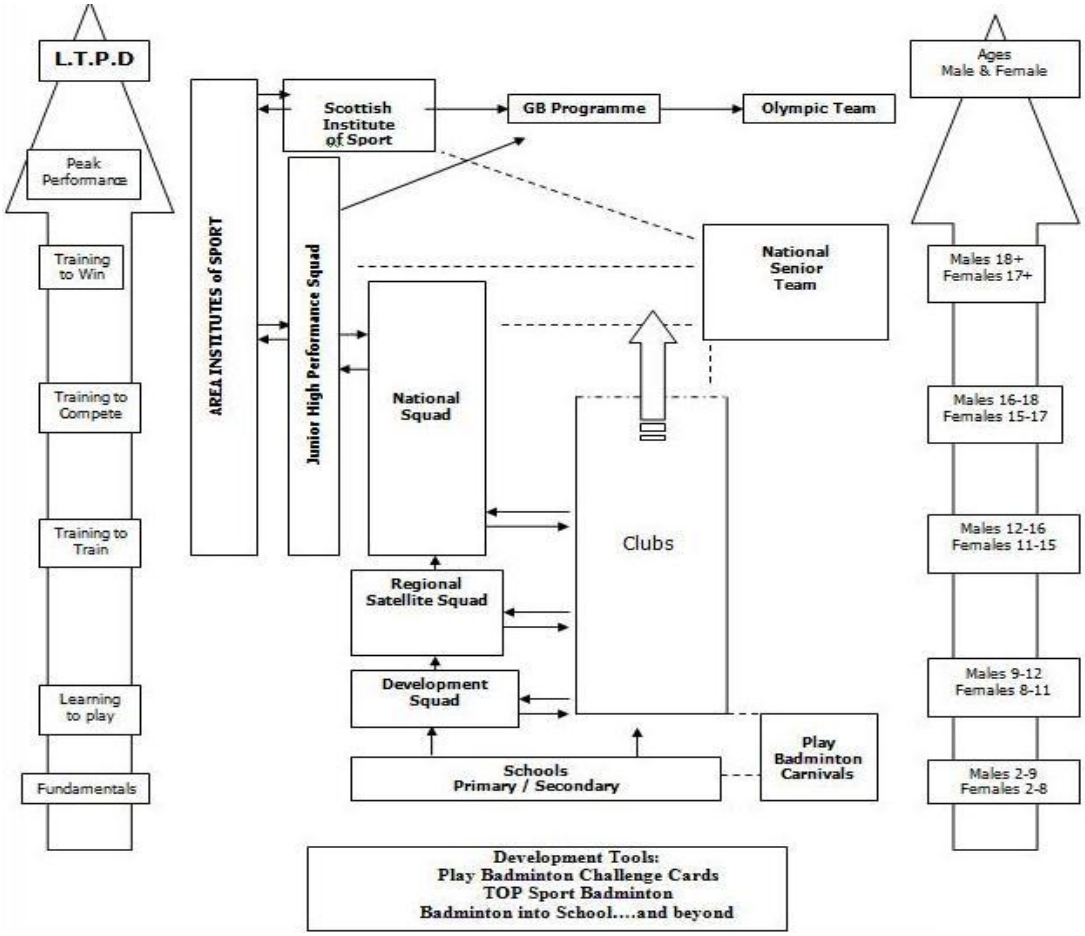


Figure 8 Scottish Badminton Player Development Pathway, (Scottish Badminton Performance plan 2007-2014).

Overall all four nations have a similar structure for developing badminton players, which ultimately feeds into the World Class Programme. Each year the top international players and the athletes with potential are selected into the Great Britain (GB) programme, which has three distinct stages; world class talent pool, world class development and world class podium (GB World Performance Programme; 2007-2012). The same criticism can be levelled at badminton as discussed earlier with the sport development continuum, in that there is no clear level of support for the grass roots stages. It is unclear what children need to do to access the World Class Talent Pool and there is not a clear pathway to the top. There is no support for those that do not make the right test results in the early years, that is, there is a lack of flexibility or depth to allow for the late developer. Effectively, the programme limits itself to a very small number of athletes from the initial stages and

therefore limits the chance of success. Conversely it could be argued that by focusing resources it provides a chance of success, rather than spreading support too thin, which would lack volume and quality.

The freedom afforded by such an approach can also be considered a weakness as the pathway to the GB programme or medal environment lacks clarity and is poorly defined, with no specific stage for athletes to transit from. Coupled to this is the allocation of funding and support services to the athletes which are continuously under pressure from central funding bodies. The system is also unclear in that no ages are attached to any particular group of players. A fundamental difference to China lies at grass roots level and ideological approach to development. The UK system relies heavily on parents and volunteers in the initial stages. As such the coach education system in the UK is open to all to try and raises the participation level. There are less rigid requirements to coach in the UK as much is done on a voluntary basis; in fact this is encouraged and widely promoted, whereas Chinese Badminton requires coaches to enter at a much higher standard. Coaching is delivered by professionals rather than volunteers. The coaches are often former players with high levels of technical and tactical knowledge. As Williams and Reilly (2000) have mentioned, if children have opportunities to access the best coaching and training from an early age, it is more likely they will become elite athletes. The UK system prefers a more engaging approach centred on fun and enjoyment and life-long participation, often operating without accurately defined benchmarks, which can cause a lack of clarity in assisting athletes to make decisions as to the most effective ways to progress to excellence.

4.2.3. Chinese Badminton Development Structure

Chinese badminton believes that Special Sport Talent Education is for children who are naturally gifted and with a combination of hard work and training, good results can be achieved (Li 2007). Figure 9 illustrates the Chinese Badminton programme, which attempts to proactively seek out those who possess the raw materials for world-class success and those who respond positively to intense training and a competition environment. The single pathway for development demonstrates a strong commitment and highly controlled support system, with high-quality coaching from the start playing an integral part. The structure is closely connected with the athlete's academic education programme and focuses on developing exceptionally talented sporting children.

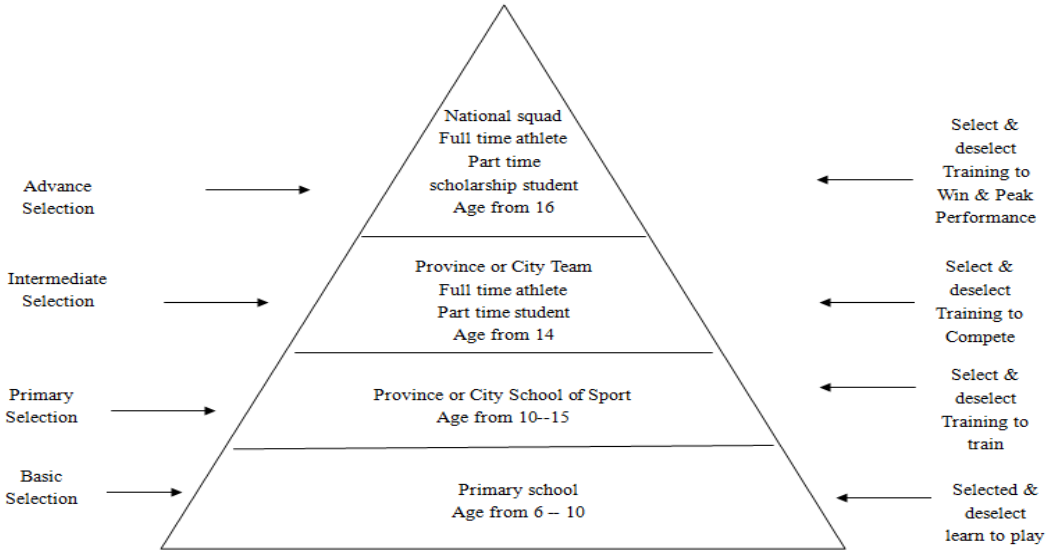


Figure 9 Chinese Badminton Player Development Pathway.

The development continues using a pyramid system to create elite badminton players. China starts selection at a young age. Selected children begin on a structured pathway and training programme, where the children's performance is closely monitored. The system is very willing to de-select children who do not show future promise (Houlihan and Green 2008). The four distinct development stages are all based around intensive progress as opposed to the UK's badminton development plan, which follows a more natural progression. The Chinese system filters children into certain sports from the very early stages. This filtering system is based on suiting their body type or physical build and attributes to specific sports. For example, some children could be very tall for their age and would therefore be better suited to basketball. Family history and bone scanning is also used to predict height in the future to ensure that the system is not picking out those with early maturation. Whilst other children might possess good hand-to-eye co-ordination may be better suited for badminton.

On the positive side the Chinese system gives talented children access to high-quality resources in specific developmental programmes without the need for financial support from their parents. Talented children are actively engaged with professional and expertly trained staff, to provide high quality developmental programmes (Baker *et al.* 2003). Baker *et al.* (2003) indicated that the successful development of an athlete is often down to their ability to access better resources; specifically they defined the most significant point being an athlete's access to an expert coach who is able to offer them high quality practice.

A negative aspect of the Chinese system is the intense and heavy training demands placed on children from a young age. These can place the young athletes at risk physically, as it often results in many injuries (Baxter-Jones Maffulli and Helms 1993). These sports academies based at schools require children to move away from home to boarding school from a young age. This allows them to participate in a heavy sporting workload. A significant negative impact of this is as athletes become better the amount of time spent on their academic education is reduced. This can limit opportunities for a career after professional sport. It should also be noted that a ruthless de-selection process takes place with little attention given to exit strategies.

4.2.4. Summary

In summary the two countries badminton programmes have a few similarities. Both countries have TID programmes with each receiving funding from their respective governments. Their mission is to enable athletes to train and compete on a full-time basis. The respective systems places demands on achieving international success that includes winning medals at major sporting events. The players' development systems both fit into a pyramid structure that has a broad base at the foundation levels that narrows to the elite performers at the top.

There are however far more significant differences between the two countries than there are similarities. It has been highlighted that in China there is a clear and structured development pathway, where each year there is active selection and de-selection of players through the use of performance filters and measures (Hubei Badminton strategy plan 2002-2006). In the UK, the development structure pursues the natural progression system where there are equal opportunities that can take an individual from recreational foundation levels through to the high performance levels. Therefore, each sport places a heavy reliance on the long-term commitment from both players and their parents or guardians. The filter system is only limited by an individual's ambition and ability.

Another difference is how badminton government sports funding is operated in the two countries. In the UK, the Sports Athlete Personal Awards directs funds to an individual athlete. There are three levels of support: talent, development, and podium. The

programme focuses resources on athletes who have the potential or are on track to win medals at major championship events. Therefore young children at the start of their development require support from their parents or family. Conversely, in China children that are identified with potential from the very beginning all the way to the elite international level are provided with high-quality professional coaching and support with no need for their parents or family to contribute any financial support.

This investigation also indicated another difference. The UK badminton system relies heavily on after-school club coaches, parents, or volunteers at the foundation level. As a result, this coaching education system leads to a loose set of standards with less rigid requirements to be a UK qualified coach. In China, the situation is quite different as to become a badminton coach requires a high entry standard leading to Chinese badminton coaching being delivered by professionals rather than volunteers at all levels.

The research suggested several factors in relation to talent in badminton could be classed as intangible elements. Physical capacity, technical, and tactical skills are necessary components in creating an elite badminton player. It has also been shown that there are differences in TI as it relates to badminton players in both countries. In the UK, TI is based on testing young children's physical sport and badminton abilities and testing children who already have experience in being trained in badminton; albeit at an older age than their Chinese counterparts. In contrast, Chinese TI looks at younger children's innate qualities not just in the field of badminton. Testing begins at a much earlier age and is much more structured throughout their development.

Summary table:

Country	CHINA	UK
Funding	From their respective governments.	
Mission	Enable athletes to train and compete on a full-time basis, with the expectation of winning medals at major sporting events.	
Development System	A pyramid structure that has a broad base at the foundation levels that narrows to the elite performers at the top.	
Funding	Direct to the programme, from the foundation level to the international elite level.	1. Direct to an individual athlete and to their programme. 2. Only athletes who have performed to a certain level or are on track to win a medal receive funding.
TI	Selection each year.	Equal opportunity.
Filters system	De-selection each year.	Individual's ambition and ability.
TI (age)	Identify children during tests (aged 6 to 10), who are not in the programme, but have the raw material needed for success.	Identify children under 12, who are in the programme or who have had badminton coaching.
TI (methods)	Identify children tested on a scientific basis and on observation of their innate abilities.	Identify children that are tested on their physical and badminton abilities.
Coaches	High standards level required as a player then professional qualifications	Less required.
Foundation level	Professional coaches delivering even at this stage.	After-school club coaches, parents, or volunteers.

Table 7 Badminton system and TID similarities and differences between two countries

In conclusion, (Table 8) although there are some similarities in green and differences in red between the two countries TI systems these are more than out-weighed by their differences.

5. Questionnaire Results

5.1. Introduction

This chapter focuses on the quantitative results of this dissertation. It primarily concerns itself with the comparative analysis of two sets of questionnaires that were completed by the British and Chinese national badminton teams, respectively.

The raw feedback collected has been graphed to aid the reader's understanding, descripted two groups of samples and compared to highlight any differences between both national teams and the players within those teams (see table 9, Questionnaire study).

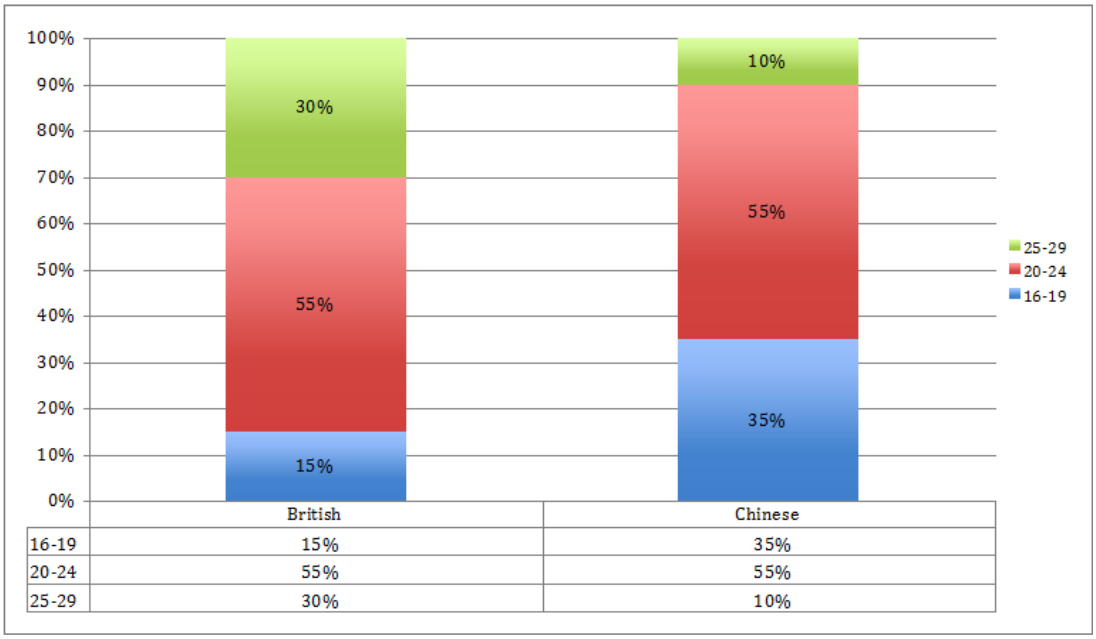
Objectives	• Discovery general information about both countries' athletes and compare both countries' athletes' development. • Compare athletes' view on the Talent and TI.
Background	• Pilot study questionnaire with four athletes, to allow me to understand the respondents, to check the logic of the questions, and to test the data analysis. • 40 athletes filled out the questionnaire. To ensure athletes returned the questionnaire, athletes were approached in person and the researcher waited until they filled out the questionnaire on that day. • Questionnaire ethical considerations (see table 5, p47).
Methods	• Separated to four areas to analyses: o 1. Athlete information. o 2. Athlete development. o 3. Athletes TI test. o 4. Athletes' views on talent. • Generated codes for each question, using SPSS and Chi-square tests to analyse if the two countries have significant differences. • Displayed 14 figures and tables to discuss each area.
Result	• Indicated Chinese players begin training at a younger age and have a longer training period, and that their world ranking is higher than that of British players. • Chinese players are full-time athletes, most British players are students. • Only TI tested players in the Chinese team, some British players had never done a TI test. • Both countries players' highlighted eights key skills and attributes for badminton players.
Discussion	• The two countries' athletes' age, ranking, occupation, age of badminton specialization, training hours linked with their age. • TI test for both countries athletes. • Player sport career path influence. • Discovery of players' views on the key skills and attributes for top badminton players, for the TI test.

Table 8 Questionnaire analysis

5.2. Sample of Description

5.2.1. Age of International Players

The sample was two groups of international badminton players, a total of 40 individuals. Questionnaires and the cover letter were handed out to each player. Forty papers were returned, representing a 100% response. This questionnaire was confined to elite international badminton players from each national team. Figure 10 shows the players' ages.



	British	Chinese
16-19	15%	35%
20-24	55%	55%
25-29	30%	10%

Figure 10 Percentage of the athletes that participated in each age group.

The data in Figure 10 shows that 55% of the respondents are within the 20-24 bracket in both the Chinese and British groups. Although, on average, the Chinese players are younger than the British players. Over the age of 25 there is 10% of the sample being Chinese but 30% of the British players. This shows that Chinese players develop at a younger age.

5.2.2. Month of birth effect international badminton player

Date of Birth Breakdown by Quarter	No. Of CHN Players	Percentage	No. Of UK Players	Percentage
1st Quarter (1st January - 31st March)	11	55%	5	25%
2nd Quarter (1st April - 30th June)	3	15%	4	20%
3rd Quarter (1st July - 30th September)	2	10%	6	30%
4th Quarter (1st October - 31st December)	4	20%	5	25%
Total	20	100%	20	100%

Table 9 Month of birth of badminton player between two countries.

Table 10 shows 20 Chinese players in the world ranking top 25. Of the Chinese sample, 55% of the players were born in the first quarter of the year, 15% of players were born in second quarter, 10% of players were born in the third quarter, and 20% of players were born in the fourth quarter. The result showed more than half of the Chinese players were born in the first quarter of the calendar year.

Also, Table 10 shows that the British players' birthdays are more evenly spread across the quarters of the calendar year. This is a potential indicator of the British system accommodating more natural progress.

5.2.3. Number of years the players have been training

Two countries player's period of training.

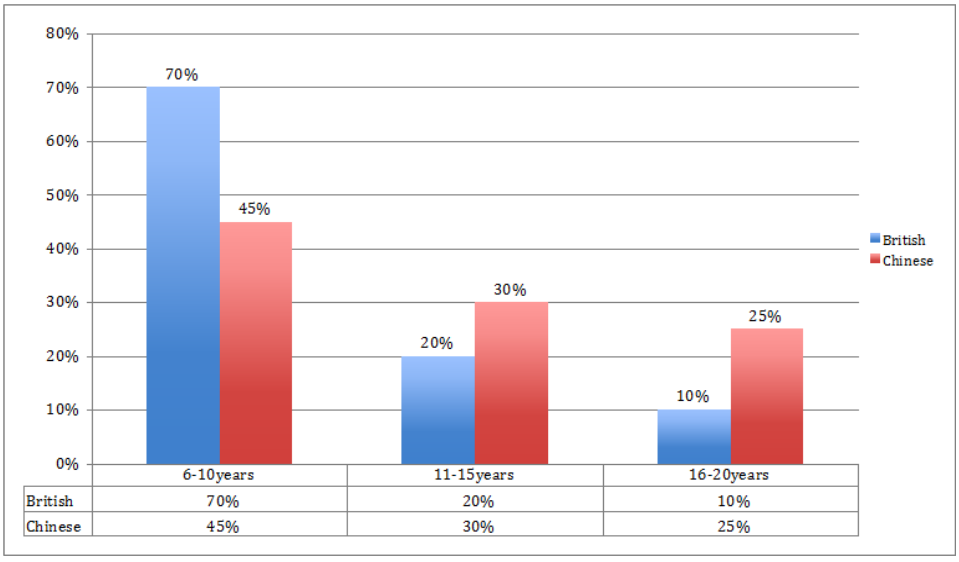


Figure 11 Athlete period of training

The data in Figure 11 shows that most of the British Players have less than ten years of training. But more than half of the Chinese players (55%) have trained for over ten years. The data shows from 6-10 years period that 75% of British players trained in this period, and 45% of the Chinese. From 11 to 15 years there are 20% of the British players and 30% of the Chinese. 10% of British players and 25% Chinese players have trained for 16-20 years.

5.3. Sample of Comparison

5.3.1. Badminton Player's Occupation

A comparison of the occupations of the two countries' players.

Group / Occupation	Full Time Athlete	Student	Total
British	7 (35%)	13 (65%)	20
Chinese	20 (100%)	0	20
Significance level	p=0.00	p=0.00	/

Table 10 Player's occupations

Looking at the data in Table 11, the Chi-squared test was p=0.00 for the full time athlete, and p=0.00 for the student. The result showed significant differences between the athletes' occupations in the two countries. All of the Chinese players were training on a full-time basis; no Chinese players were studying part- or full-time. This implies that there must be support for the Chinese players that allows them to train on a full-time basis. It should be noted that the Chinese sports system is very demanding on athletes and requires them to train on a full-time basis.

Comparing the same statistics for British players, just over one third of the players (35%) who are able to engaged with training on a full-time basis, with the remainder (65%) training on a part-time basis. The impact of these percentages is potentially lessened as the British training structure is more flexible in terms of accommodating players' external commitments. However, it should be noted that only a few British players (35%) are able to play full time on a fully funded basis.

5.3.2. Player's World Ranking

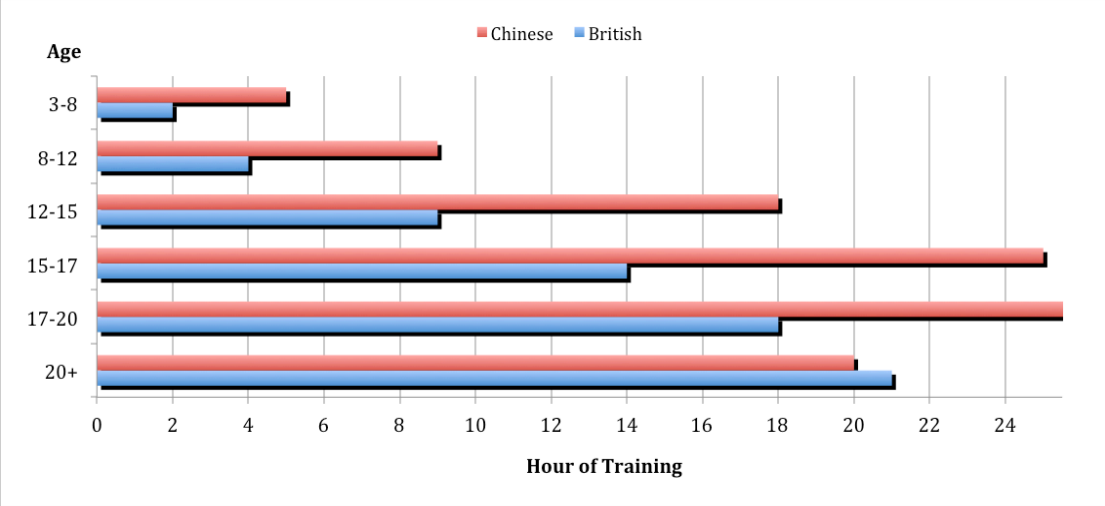
Group / World Ranking	1--10	11--20	Above 20
British	5%	15%	80%
Chinese	40%	35%	25%
Significance level	p=0.01	p=0.15	p=0.00

Table 11 Athlete world ranking

The data in Table 12 show the world ranking ranges of the players who completed the questionnaire. There is significant difference, shown by the result p=0.01, for players ranked in the top ten in the world, with more Chinese players than British in this category. 80% of the British players hold world ranking positions above 20, with a Chi-squared test p=0.01. There could be two reasons for this; the majority of the British badminton players are part time and therefore they will have less time available during the day to train. When compared to the Chinese players, the relative lower ranking of the British players could also be due them playing in fewer ranking tournaments during the course of the year. Overall, there are significant differences that emerge when comparing the world rankings of both countries' players.

5.3.3. Training Hours Versus Age Group

The figure below shows the number of hours per week the badminton players from both countries train by age group.



Age	3-8	8-12	12-15	15-17	17-20	20+
Sig Level	p=0.00	p=0.00	p=0.00	p=0.00	p=0.09	p=0.57

Figure 12 Weekly training hours by age group and country.

Figure 12 shows there are significant differences between the Chinese and British training hours for the first four age groups, from age 3-17. The results for the age groups 17-20 and 20+ show no significant differences between the Chinese and British players.

From the data in Figure 12 it can be seen that across all the age groups, with the exception of 20 years and older group, that the Chinese players spend considerably longer training than their British equivalents. For example, even amongst for 3-8 years category the Chinese players are training more than twice as long as their British counterparts (five hours per week versus two hours per week).

Separate data analysis for Figure 12 shows that the majority of the Chinese children who are playing badminton at the age of seven or eight were already spending more hours training per week than British children in the 8-12 years age group. British children in this age group were training four hours per week on average while the Chinese children in the lower age category were already training nine hours per week.

In the 12-15 age group, Chinese players were found to be training for more than twice the number of hours per week than their British counterparts in the same age group (18 hours for the Chinese players versus an average of 9 hours for the British players). The Chinese players were training for the equivalent of three hours per day, six days per week. This does raise the question for the British players in this age group that as there were far fewer of them training full time, their other commitments could be a constraint on the number of hours they could train. The later data shows that even in this age group the Chinese players have already specialised in the sport of badminton.

In the 15-17 age group, British badminton players were training an average of 14 hours per week, however the Chinese players in the 15-17 and 17-20 age group were training for 23 hours or more per week.

Referring back to the data in Table 11, Chinese badminton players were training on a full-time basis once they had reached the age of 16. The majority (65%) of the British players were still training part time. This is the reason that Chinese badminton players spend significantly more hours per week training than their British equivalents.

It is noted that the only age group in Figure 12 where British players train, on average, more hours per week than their Chinese counterparts is in the 20 years old or more category. An additional point to note is that the data shows that in this age category the total number of hours that Chinese players train, on average, falls for the first time. This could be because by that stage in their training Chinese players have completed such a significant number of hours training, including the basics of techniques, match play, and strategy, for example, that their training focus shifts to the more technical aspects of the skills they have built up and/or on specific qualities they need to develop further.

5.3.4. Player Starting Age

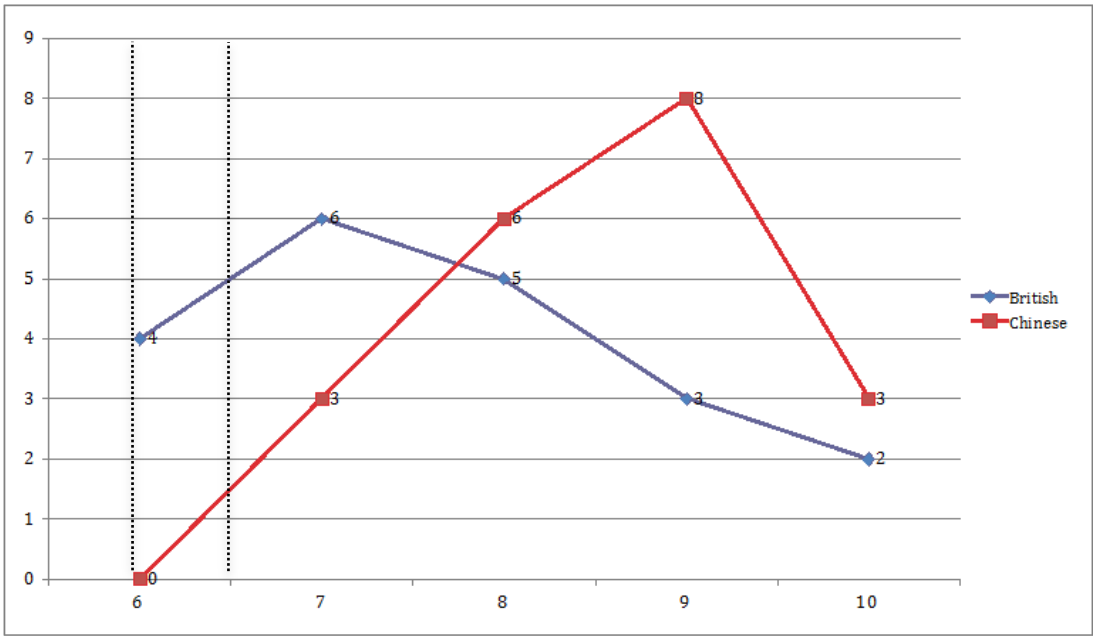
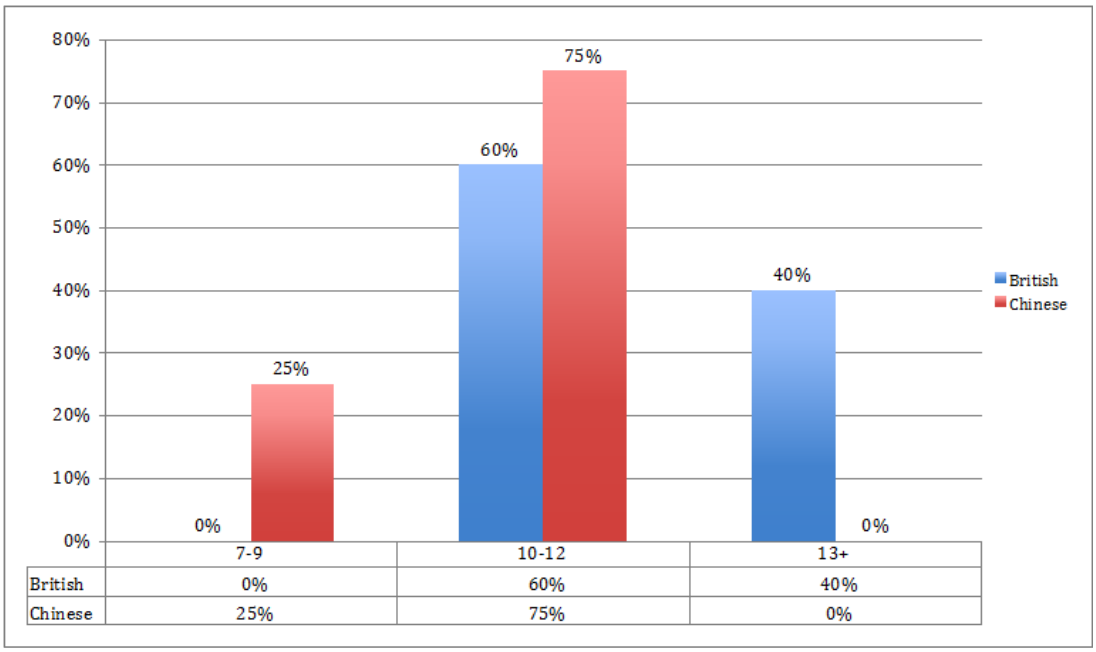


Figure 13 Age at which players started playing badminton.

Figure 13 shows a comparison between the ages of when players from the two countries started playing badminton. It can be seen that there were no Chinese players that started earlier than the age of seven, with a Chi-squared test compared on age six of p=0.03, which means a significant difference on this age bracket. However, there are no significant differences between ages seven to ten for these results according to the Chi-squared test.

5.3.5. Age at which the Children Specialized in Badminton



Age	7-9	10-12	13+
Sig Level	p=0.02	p=0.32	p=0.00

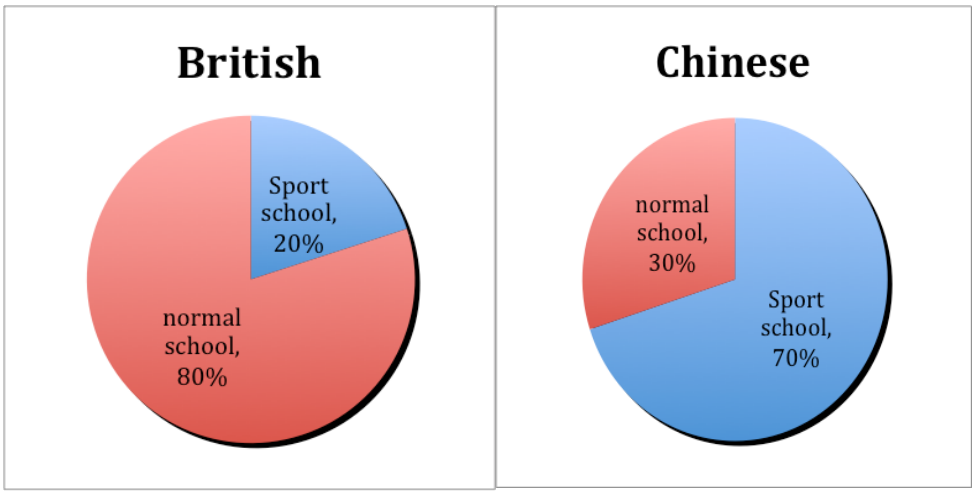
Figure 14 Children specializing in badminton.

Figure 14 shows a comparison between the ages at which children from the two countries started to specialise in badminton. The data shows that British players start to play badminton at quite a young age, however before the age of 9 none of the players had specialised in the sport of badminton. The majority of the players in the sample had given up their other sports or activities to concentrate on badminton when they were between 10 and 12 years old, with a significant increase to 60% (from 0% in the previous age group). The remaining players in the sample specialised in badminton by the time they were 13 years of age or older.

Amongst the Chinese players in the sample, 25% of them specialised in badminton during the 7-9 years age group. The remaining 75% had done so by the ages of 10-12. One of the reasons for this is likely to be that the Chinese junior team will not accept a new player who is over the age of 13, as the cut-off age for accepting new players into Chinese badminton schools is 12 years of age; this source of information from the questionnaire shows that there were no Chinese players in the sample that had left it until the age of 13 plus to specialise in badminton.

Overall, according to the Chi-squared test there are significant differences between both countries' players for the age 7-9 and 13+ age groups who specialise in badminton. Between age 10-12 years old, p=0.32, there are no significant differences. Comparing both countries' players, the Chinese start specializing earlier than the British.

5.3.6. Schools of Sport



	Normal School	Sport School
Sig Level	p=0.00	p=0.00

Figure 15 Player training in sport schools.

Figure 15 compares the education type of the surveyed badminton players. The data indicates the difference between British and Chinese badminton players that are in sports schools. 70% of the Chinese players come from a sports school, with only 30% of players starting their professional badminton careers after attending a normal, academic school. In these specialised sports schools there is less focus on academic study and more focus on the students' chosen sport. This is likely to be a contributing factor behind the reason that Chinese badminton players in the 11-15 years age group are able to spend 18 hours per week training; this is shown in the figure 12, players training hours by age group.

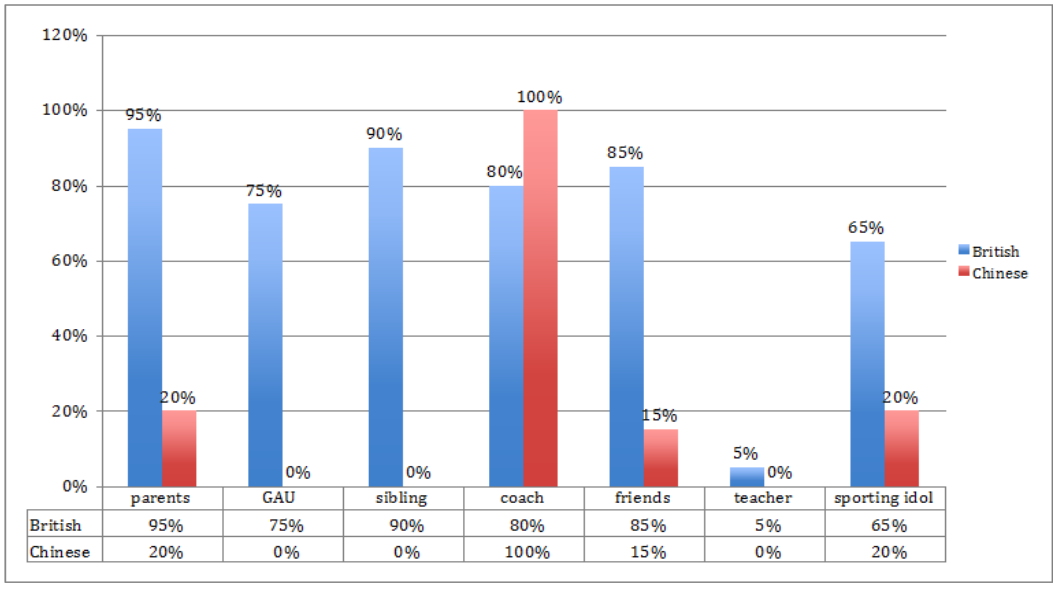
Overall, the Chi-squared test showed there is significant difference between both countries' players education system.

5.3.7. Family Involvement with Sport and Influence on the Badminton Careers

Family history in sport	Group		Total	Sig Level
	British	Chinese		
Yes	12	4	16	p=0.01
No	8	16	24	p=0.01
Total	20	20	40	/

Table 12 Athlete family involvement with sport.

Table 13 shows involvement by family into the players' sport. For the majority of British badminton players their family is involved with the sport. This could result in the influencing and introduction of other family members into the sport. Interestingly, most of the Chinese badminton players' families do not have any sporting background. The results from the Chi-squared test P-values are 0.01, that is less than 0.05, which indicates significant difference between both countries' players' family involvement with their sport. Figure 16, below, also shows the influence of this on the athletes' careers.



	Parent	Grandparent	Sibling	Coaches	Friends	Teaches	Sporting Idol
Sig Level	P = 0.00	P = 0.00	P = 0.00	P = 0.04	P = 0.00	P = 0.32	P = 0.00

Figure 16 Influences on athletes' badminton careers

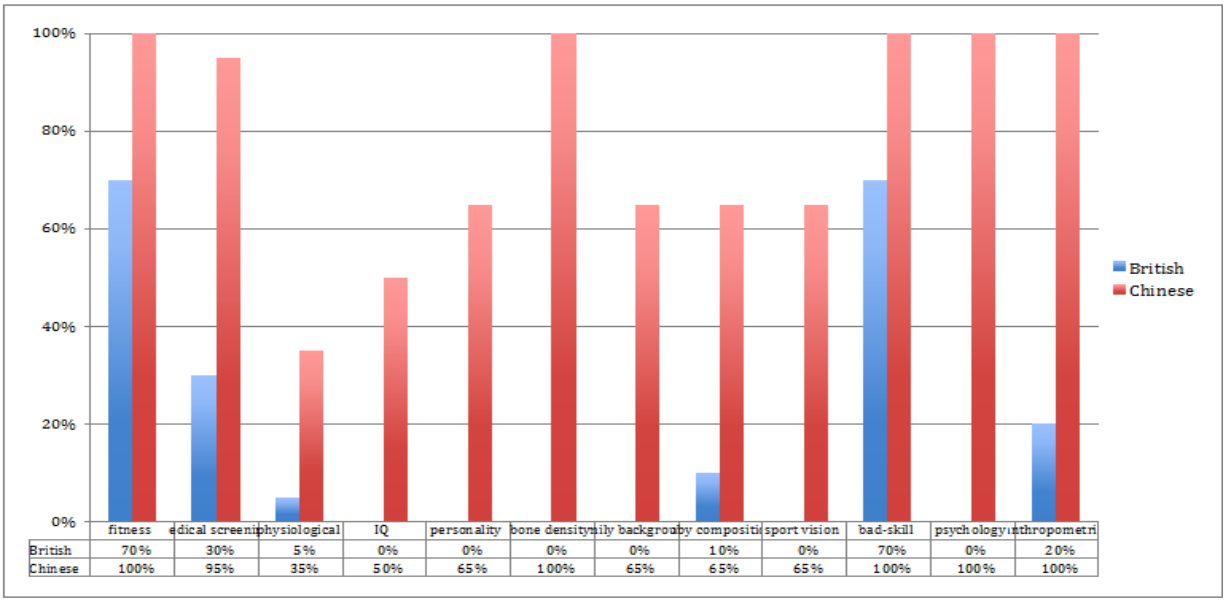
Figure 16 indicates there is significant difference between the two countries according to the Chi-squared test. This could be one of the reasons that explains why British badminton players view their parents as having the highest influence (95%) on their careers with their sibling's influence not far behind at 90%. Other relations of the British players have a 75% influence, with 65% citing influence of their sporting idol(s) and 5% their teachers having an influence on their careers. From this data it appears that for British players members of

their immediate and extended family provide them with either emotional or financial support so they can pursue their sport careers.

Conversely, the Chinese players' views are quite different. They do not consider their close family as having any influence of their badminton career, and they only rate their parent's influence at 20%. They do, however, view that 100% of the influence on their careers come from their coaches. This indicated that most Chinese badminton players at the elite level are introduced to the sport via the sport system or talent identification rather than by members of their family.

5.3.8. Talent Identification Tests

The following graph compares which tests have been done on both countries' players to determine the talent identification.



	fitness	edical screeni	physiological	IQ	personality	bone density	mily backgrou	by composiți	sport vision	bad-skill	psych ology i	nthropometri
British	70%	30%	5%	0%	0%	0%	0%	10%	0%	70%	0%	20%
Chinese	100%	95%	35%	50%	65%	100%	65%	65%	65%	100%	100%	100%

	Fitness	**Medical**	**Physiological**	**IQ**	**Personality**	**Bone Density**
Sig Level	p=0.00	p=0.00	p=0.02	p=0.00	p=0.00	p=0.00
	Family Background	**Body composition**	**Sport vision**	**Badminton skill**	**Sport psychology**	**Anthropometric**
Sig Level	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00

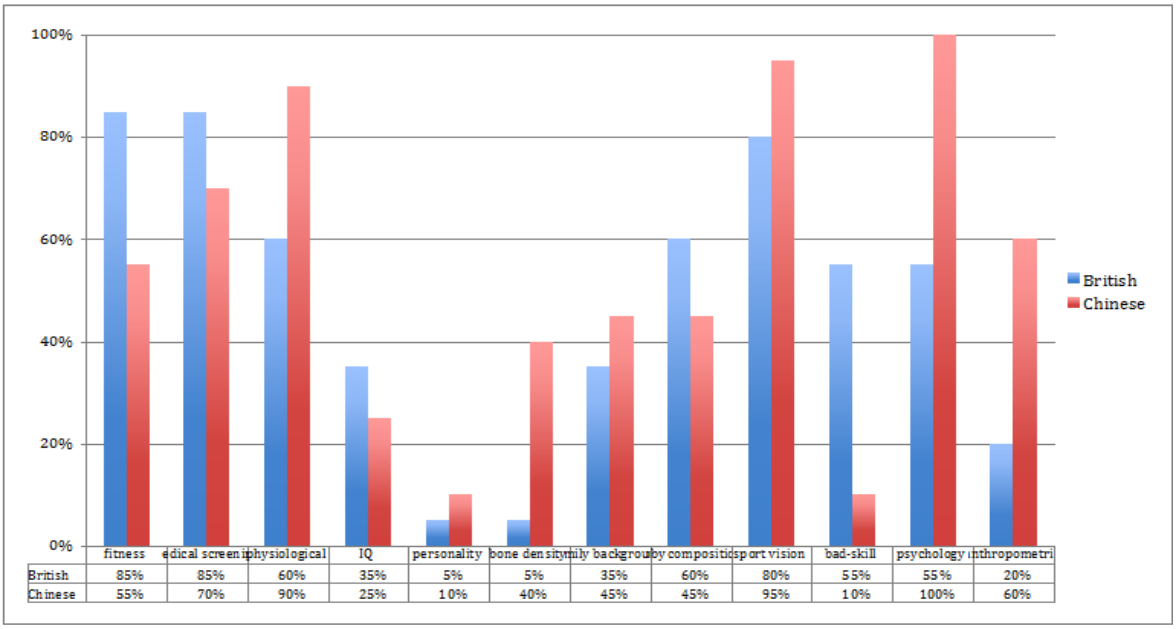
Figure 17 Talent identification tests.

Of the twelve talent identification tests contained within the data, shown in Figure 17, all the test results P-values are all less than 0.05, so between the two countries there is a significant difference according to the Chi-squared test. The graph shows that most of the Chinese badminton players have been through every test. Therefore even tests like psychological, anthropometric, bone density, medical screening, general fitness, and

badminton skills tests were used amongst a significant proportion of those who responded to the questionnaire. The view of Chinese sports is that these types of tests are important in identifying and developing talent and therefore sufficient resources are made available to ensure they are properly conducted.

Figure 17 shows that the British badminton players had only been through six of the tests (50% of those available). The highest proportion (70% in each case) of British players had, perhaps unsurprisingly, been through general fitness and badminton skills tests. Of the remaining four tests, the proportion of players being subjected to them was no more than 30%. With the general fitness and badminton skills tests being relatively low cost to administer and provide an estimation of potential this could be behind the reason why these two tests had the highest proportion of British players completing them.

5.3.9. Review the Importance on Talent Identification (TI) Test



	fitness	edical screen	physiological	IQ	personality	bone density	mily backgrou	by compositi	sport vision	bad-skill	psychology	nthropometri
British	85%	85%	60%	35%	5%	5%	35%	60%	80%	55%	55%	20%
Chinese	55%	70%	90%	25%	10%	40%	45%	45%	95%	10%	100%	60%

	Fitness	Medical	Physiological	IQ	Personality	Bone Density
Sig Level	p=0.04	p=0.26	p=0.03	p=0.50	p=0.55	p=0.01
	Family Background	**Body composition**	**Sport vision**	**Badminton skill**	**Sport psychology**	**Anthropometric**
Sig Level	p=0.53	p=0.75	p=0.16	p=0.00	p=0.00	p=0.01

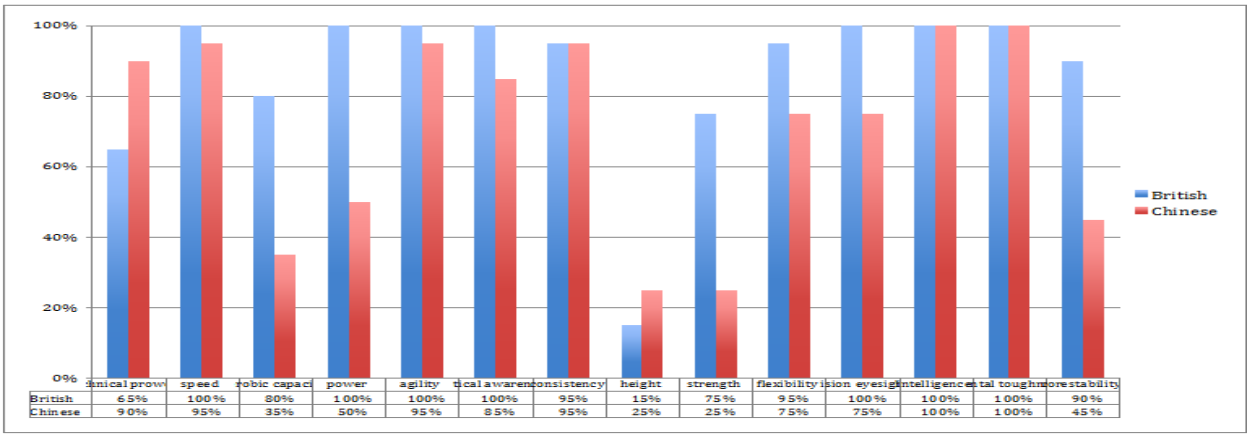
Figure 18 Player's view on the important of TI test

Figure 18 displays the players' views on the importance of TI tests. According to the Chi-squared test result, there are six tests with p-values larger than 0.05, which shows players' views on those six tests have no significant difference. These tests are: medical test, IQ test, personality test, family background check, body composition test, and sport vision check.

The data indicate that both countries players have similar views of the importance those six tests, with the sport vision check (95% and 80%) being viewed as more important than the personality test (10% and 5%), which was viewed as the least important. This could lead coaches to consider the necessity on the TI test. The players' views are that the medical check and body composition check are paramount.

Compared to the rest of the six tests, the results showed that both countries' players viewed the significant tests differently. Although the results indicate six TI tests are the most common for the sampled Chinese badminton players, namely psychological, anthropometric, bone density, medical screening, fitness, and badminton skills test, the Chinese players rated psychological, sports vision, and physiological testing as very important, rating them all higher than 90% (Figure 18). The Chinese players also valued the importance of mental toughness, and strong mindedness in badminton. The players did not rate the badminton skills test highly as they possibly considered that it could be developed in training.

5.3.10. Identification of which Skills and Attributes are Important for Elite Badminton Players



	Technical	Speed	Aerobic Capacity	Power	Agility	Tactical	Consistency
Sig Level	p=0.06	p=0.32	p=0.00	p=0.00	p=0.32	p=0.08	p=1
	Height	**Strength**	**Flexibility**	**Vision (eyesight)**	**Intelligence**	**Mental toughness**	**Core stability**
Sig Level	p=0.44	p=0.00	p=0.08	p=0.02	p=1	p=1	p=0.00

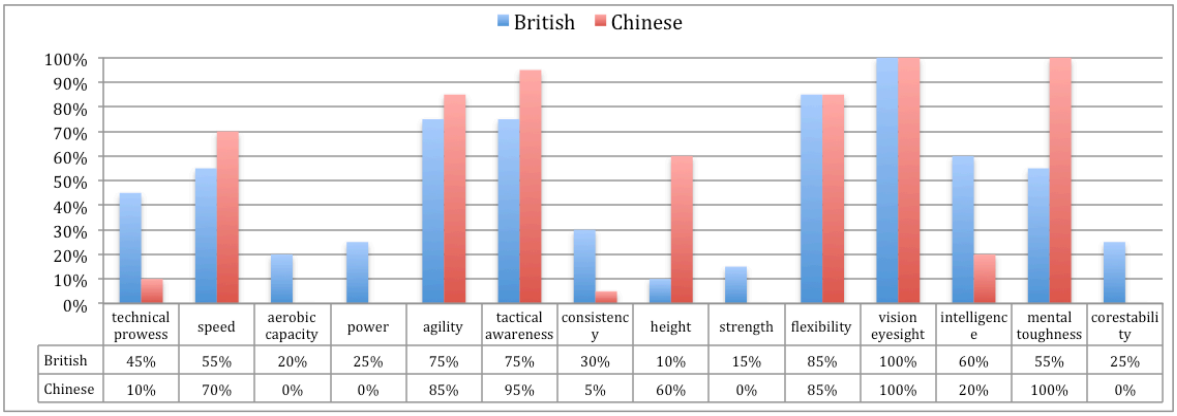
Figure 19 Elite badminton player's skills and attributes.

Figure 19 presents the players' rating of skills and attributes they consider are needed to be an elite badminton player. The results show that both countries' players viewed mental toughness, consistency, intelligence, tactical awareness, agility, speed, flexibility, and vision/eyesight as all being important skills for an elite badminton player. However, four

attributes had Chi-squared test results of p=0.00, indicating that both countries players' had significantly different opinions on aerobic capacity, power, strength, and core stability. The comparison result showed British players placed more emphasis on the strength conditionings skills, for example 100% of the British players rated power as important, compared with 50% of the Chinese players. Similarly, the results for strength were 75% for the British compared to 25% for the Chinese.

According to the Chi-squared test the two countries' players views showed no significant difference for mental toughness and consistency, which they both highly rated (100% and 95%, respectively). This is explained in that it is widely considered that world-class players require mental toughness and consistency.

5.3.11. Skills and Attributes that need to be Accurately Identified amongst Young Children



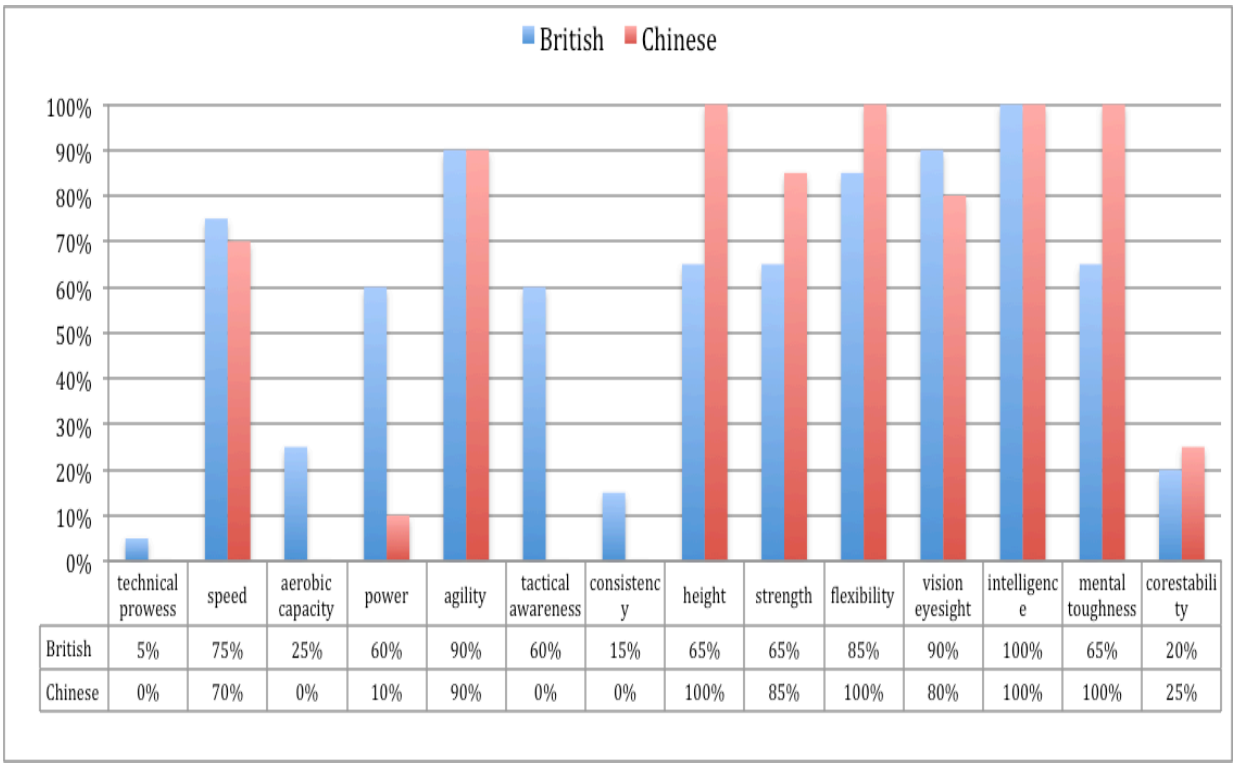
	technical prowess	speed	aerobic capacity	power	agility	tactical awareness	consistency	height	strength	flexibility	vision eyesight	intelligence	mental toughness	corestability
British	45%	55%	20%	25%	75%	75%	30%	10%	15%	85%	100%	60%	55%	25%
Chinese	10%	70%	0%	0%	85%	95%	5%	60%	0%	85%	100%	20%	100%	0%

	Technical	**Speed**	**Aerobic Capacity**	**Power**	**Agility**	**Tactical**	**Consistency**
Sig Level	p=0.01	p=0.33	p=0.04	p=0.02	p=0.44	p=0.08	p=0.04
	Height	**Strength**	**Flexibility**	**Vision (eyesight)**	**Intelligence**	**Mental toughness**	**Core stability**
Sig Level	p=0.00	p=0.08	p=1	p=1	p=0.01	p=0.00	p=0.02

Figure 20 Skills and attributes to identify amongst young children

Figure 20 shows the players' views on what skills and attributes are important to accurately identify amongst young children. The data shows significant differences in the views on eight skills and attributes, especially height and mental toughness. It is possible that both countries players' view identifying future height and mental toughness in youngsters as unpredictable. The elite players rate the following (55% or greater) as important identifiers: speed, agility, tactical awareness, flexibility, sports vision eyesight, and intelligence.

5.3.12. Innate Skills and Attributes.



	technical prowess	speed	aerobic capacity	power	agility	tactical awareness	consistency	height	strength	flexibility	vision eyesight	intelligence	mental toughness	corestability
British	5%	75%	25%	60%	90%	60%	15%	65%	65%	85%	90%	100%	65%	20%
Chinese	0%	70%	0%	10%	90%	0%	0%	100%	85%	100%	80%	100%	100%	25%

	Technical	**Speed**	**Aerobic Capacity**	**Power**	**Agility**	**Tactical**	**Consistency**
Sig Level	p=0.32	p=0.73	p=0.02	p=0.00	p=1	p=0.08	p=0.00
	Height	**Strength**	**Flexibility**	**Vision (eyesight)**	**Intelligence**	**Mental toughness**	**Core stability**
Sig Level	p=0.15	p=0.08	p=0.38	p=1	p=1	p=0.00	p=0.71

Figure 21 Innate skills and attributes.

The data in Figure 21 show that current elite badminton players consider a number of skills and attributes as being more heavily influenced by innate talent. The data indicates that players rated that the following highly: speed, agility, height, intelligence, mental toughness, flexibility, strength, and sports vision eyesight. Both countries' players had significant differences on mental toughness, power, aerobic capacity and consistency. Overall, players rate technical prowess, aerobic capacity, consistency and core stability lowly. This is possibly those four skills and attributes are able to be developed later on in their sporting development, and are not influenced as much by anything innate to the individual.

5.4. Summary

The purpose of this section of the research was to collect and analyse data on the current national badminton players from China, Britain, and Ireland and garner their views on Talent Identification (TI). Overall the data in Figures 10, 11, 13 and Tables 11 and 12 conclusively show that there are significant differences between Chinese and British badminton players, in terms of their respective world rankings, number of hours training per week, the length of their training year, the age at which they started playing badminton, and the age at which they specialised in it.

The results indicate that, on average, the Chinese national squad's players are younger and performed better in the world rankings than their equivalent British players. The comparison of the data also showed that the Chinese players specialised at an earlier age and spent significantly more hours training than those in Britain.

Based on a review of the Chinese Badminton Player's Development Pathway (see Figure 9) there are three major aspects that contribute to this result.

1) Only those children comprehensively tested can get into the professional sports system;
2) The sports schools spend more time on badminton training rather than academic study;
3) The youngest age a player is able to get into a professional badminton team is 16.

From the data collected it shows that Chinese badminton players, on average, start training on a full time basis at a younger age as well as competing at an elite international level than their British equivalents. The peak age of performance amongst Chinese players arrives earlier and the players retire earlier than those in Britain. British badminton players peak at international level, on average, later than those in China and they tend to have a longer competitive playing career. That is not to say that a British badminton player has, overall, a longer badminton playing life as the data shows that the Chinese players are already playing a significant amount of badminton at the age of 7 or 8 and from then on spend significantly longer training. This could explain the Chinese, "fast track" sports development system; as opposed to the British system that has fewer hours training and therefore they reach their peak later in their playing career.

Other differences were shown in Figure 13, where the data showed that the majority of Chinese players' pathway into the elite levels of badminton followed a structured TI system. This was accompanied by a professional and structured set-up that led to the players considering that their sporting career had not been influenced very much by their family but much more by their coaches. This was very different for the British players, where the people around them, mostly their family, provided both financial and emotional support.

Taking the data contained in Figures 17 to 21, the majority of badminton players in this study highlighted the importance that TI had on the development of badminton. The key skills and attributes highlighted were: speed, agility, height, intelligence, mental toughness, flexibility, strength, and sports vision (eyesight).

6. Coach Interview Results

This chapter will present the views of the British and Chinese expert badminton coaches regarding their perspective on the development of talent within their respective player pools and the differing approaches both countries take in this regard. Eight coaches, four from China and four from Britain took part in semi-structured interviews that were recorded, with their knowledge and consent. In respect of the interviews with the Chinese coaches, their feedback was subsequently translated and transcribed into English (see Appendix VIII).

6.1. World Class Badminton Player vs How to Identify Talent amongst Badminton Players

In the expert view of the coaches, they considered it essential to understand what underlying aptitude and characteristics world-class badminton players have as a means to identify talent in young players. All eight coaches had a similar view on what the make-up of a world-class badminton player consists of (Figure 22), stating that being naturally gifted, being prepared to work hard coupled to a player with the right environment,

opportunity and access to good coaches, that is external factors and individual characteristics, were all found in world-class badminton players.

Figure 22 A qualitative analysis of to be a world-class badminton player's elements and factors.

The views on talent identification (TI) amongst children saw some different views emerging amongst the eight coaches interviewed. The four Chinese coaches all gave a similar reply, they stated that a clear, systematic approach with TI amongst badminton players was very important. It would progress in four stages from the players beginning to play through to them operating at an elite level. For example, in the interview with Han (2014), he said:

> TI is the programme the sport's governing body uses to identify which people are suitable for each respective sport. For badminton the ideal age to identify children with potential is between six to nine years of age. At this first stage we look at the children's sporting ability, their learning ability and their overall physique; the selection at this stage relies upon the coaches' experience. The second stage is at a sports school. We would select children at around 12 years of age who had a minimum of four years badminton training. We will look at the player's physical

> tests, tournament results and a number of body tests, for example bone scans of their hands and feet to predict their adult height as well as various other health checks that includes the general health profile of their family. Selection at this stage is decided by both coaches and sports scientists. At the third stage we look for players from one of the provincial teams, aged from around 14 to 16, at which point the player has typically had four to six years training. Selection is made using a combination of physical tests, tournament results and the coach's "eye" and experience. At the fourth and last stage we are looking at the national team; selection and de-selection is made on a regular basis with the basis for the decision normally made based on tournament results. The players at this stage are aged 16 and upwards.

Conversely the GB coaches had a very simple reply, they view TI as it applies to badminton players as something used at the outset of a child's sporting development to be used to guide them into an appropriate sport. The most important elements to identify children with potential would be: overall sports capabilities, good hand to eye co-ordination, and an appropriate attitude. Only one Chinese coach who had worked in the UK for many years provided some additional insight in this regard: "In the sport of badminton it requires a player to be multi-talented that need to, 'tick all the boxes' without being excellent in any one area" (Luo 2014). Figure 23 shows the views presented in the seven coach interviews, with the middle box summarising TI in relation to badminton players.

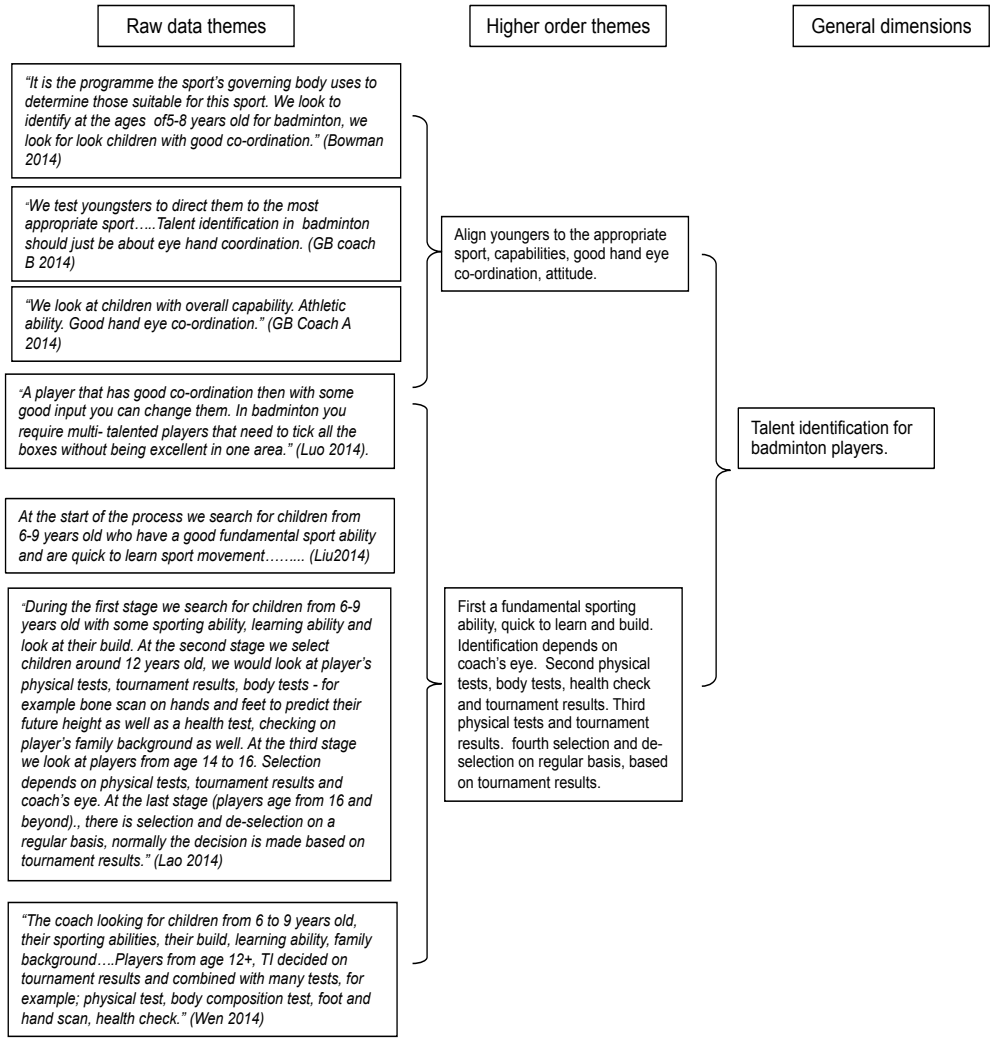


Figure 23 A qualitative analysis of TI in badminton

6.2. Badminton Player Development; Age of Specialisation and Training Hours

This study interviewed eight coaches gathering their opinions on what would be a suitable age for children to begin specialising in badminton and how the number of hours training should increase and at what age it should do so. The results showed significant differences between the Chinese coaches and UK coaches. With the Chinese badminton system, coaches look for children to start specialising in badminton from seven to nine years old. For example, the Chinese coach Lao (2014) stated:

> I think children should by playing a number of sports at young age, ideally at the age 5 they should be introduced to badminton, between the ages 7 and 9 they should start to specialise badminton so they can concentrate and spend more hours training on only that one sport.

The four UK coaches shared the view that children should only specialise in badminton at a much later age. For example, Bowman (2014) stated:

> If they are not in a professional structure they should play as many sports as possible at young age, then in the performance structure they would specialise in badminton at around the age of 10 or 11.

One interviewee identified that in UK the reason for children specialising at a later age in badminton than in the Chinese system is because in today's society people approach badminton differently.

> It is not really about when to specialise, this is determined by when you start to play badminton. In Scotland we should ask players at the age of 13 to specialise in one sport. In our country we don't get the best athletes into our sport. They will probably be playing something else. Also in today's society children have so many different opportunities competing for their time, whether it is tablet computers, smart phones, computer games as well as other sports. I don't think if you asked someone to give up football at the age of 6 to play badminton they would do it. It is very difficult to ask someone to give up other activities to just concentrate on one sport. (Interview; GB coach B 2014).

However, from the interview it is shown that children in China specialise in badminton at a much younger age than UK children.

Another difference that was discovered in this study was that Chinese players started to increase training duration for much longer and at a much younger age than the UK badminton players. Wen (2014) stated:

> In China children aged 6 to10 are training for two hours five days per week. From the ages of 10 to 14 in the sport schools training is around twenty hours per week. From the ages of 14 to18 training is for twenty five to thirty hours per week. Aged 18 and beyond training duration is reduced to only around fifteen hours on court badminton training per week with the rest of training composed of more hours on weight training and fitness.

The training focuses on technique and skill at a young age then gradually increases in intensity.

> At the beginning we concentrate on teaching children in badminton techniques, then we gradually increase the physical work. When players in the sports schools if

> they are female them from around the age of 12 (14 for male players) off-court weight training and physical training increases. (Interview; Liu 2014)

It appears that in the Chinese badminton structure, with its systematic four levels, dependent on the age of players, this is closely linked to the content of their training programmes that specialize early and deliberate practice. Children in different age groups have different training hours and intensity, with 6-10 year olds undergoing 10 hours, to 10-14 year olds receiving 20 hours, and 14-18 year olds undergoing 25 hours per week. This seems a lot of hours practice at a young age, and it would go against youth health fitness and well-being today, a study the composite youth development (CYD) model (Williams *et al*. 2014). It would be interesting to know how many children go through this programme without injury; clearly further research may be needed in this area. Conversely, the UK badminton approach to training programmes is more geared to suit the individual.

> The training programme depends on how the athlete progresses, how they develop, how they grow. The decision to start to increase frequency, duration and intensity should be taken on an individual basis when the person is ready. This will vary from person to person. (Interview; GB coach A 2014)

Although the LTAD defines stages for player age in the UK badminton programme, there does not appear to be any definitive guide as to what age a player should be undertaking a particular training regime or for how many hours they should be doing it for.

6.3. The Differing Badminton Structure and System in China and the UK

The coaches that were part of the interview were asked whether it costs players or their parents' money both to learn to play badminton and/or to get to the highest levels of badminton. Both countries coached identified significant differences between the badminton structures and systems. All of the Chinese coaches believed that there is no cost for children with potential to get into the high-performance squad and to develop to the top levels of the sport. In China, the high-performance badminton programme has extremely strong government support from the foundation to the elite level. Therefore, players do not need to worry about the costs associated with getting good coaching and playing in tournaments:

> Professional or high performance sport has high costs associated with it. In China if a child wishes to learn to play badminton within the professional set-up then at the start the child's family only pays a small amount for coaching fees, even then that

> is affordable to most people. When a young player has been selected for a sports school and thereafter all the funding for their coaching and tournaments etc. comes from the government. This means that most of the Chinese world champions do not come from wealthy families. (Interview; Wei 2014)

It should be noted that the structure of badminton in China is quite restrictive and therefore places are limited. One Chinese coach stated that only a very selective group of children and elite players would get full funding from the government:

> Professional sport is funded by the government, children with potential or talented players selected for our programme will receive full support and funding from the government that would include training with professional coaches. (Interview; Han 2014)

By contrast all of the UK coaches believed that having a middle class of wealthy family background can help a player reach a certain level. This means that, potentially, anyone could get professional coaching as long as their parents could afford it. In the UK, therefore, the high performance badminton system is looked on differently.

> Badminton is not a cheap sport, it is more a sport for the middle class. The majority of the players I am aware of I know cost their parents a lot of money. Yes, there are children that come from poor families but this is only the case if they can find someone to support them. However it remains the case that it is much easier in the UK to play badminton seriously if you have strong financial backing. (Interview; GB coach A, 2014)

There is however both funding and grants available. One UK coach identified what they considered to be the nub of the problem: "funding is required from parents until players have reached a certain level" (Interview Luo, 2015). The lack of funding support in the UK badminton structure could lead it to have a relatively weak system when compared to the system as it is operated in China.

6.4. Other Differences and Concerns

Coaches were asked if education fitted well into badminton training. All of the UK coached believed that players would be able to study whilst also doing their badminton training. The opposite was the case for all of the Chinese coaches. They said that Chinese players had to compromise their education to put in the time required for badminton

training. In China, the high-performance badminton system is very restrictive, and players have to sacrifice a lot of their education at a young age.

> In our system it is impossible to merge both high performance badminton training with a normal academic education; players from about the age of 14 have to reduce their hours of academic studies to increase the number of hours they train at badminton. (Interview, Han 2014)

The critical question is what happens to players after they retire or are de-selected from the system?

> In our system anything to do with improving the level at which a player can play badminton is always well structured and supporting. However there is a lack of developmental educational possibilities for players when they retire or are de-selected from the system. Most senior players worry about their future as they near their retirement. (Interview, Lao, 2014)

Unlike the Chinese, the UK coaches have different concerns:

> In our country there are only a few locations where good quality coaching can be delivered, many children lack the opportunity and access to good quality badminton coaching. This leads us having not that much of a talent pool to select young players from. (Interview, GB coach B, 2014)

Raising the quality and quantity of UK coaches coupled with building more junior development training centres around the UK that children could access could increase the number of talented players and enhance the overall level of badminton in the UK.

6.5. Summary

Throughout these series of interviews there were key themes that came to light as a result of the researchers' qualitative research. The main focus was what characteristics were considered and identified as being key for world-class players. Therefore, there was particular attention paid as to how talented players were identified, developed, and further developed to the elite international level in both China and the UK. It was highlighted by all of the coaches that there were external factors as well as individual characteristics that were common in world-class badminton players. These included being naturally gifted, being willing to work hard, and being within the right environment with the opportunity to access and use good coaches. Although both the Chinese and UK coaches were of the same

opinion of what it took to be a world-class badminton player when it came to the details of how they identified talented youngsters and developed them to an international level, it was found that the two countries approached the task in different ways. The Chinese talent identification programme uses a very clear, systematic approach. It progresses in four stages from young children all the way through to them operating at an elite level. It was seen that at each stage TI progress was governed by different criteria, for example age or the players' ability. The UK TI programme, on the other hand, had a very simple structure. It was shown that TI works as more of a guide in steering children into an appropriate sport. It was felt that the most important outcome was the ability to identify young children's overall sporting capabilities; for example good hand to eye co-ordination and an appropriate attitude.

Another theme that emerged was how the two countries' badminton structures and systems affected individual badminton players. It was shown that the Chinese high-performance badminton programme has very strong professional support underpinning it. Conversely, the UK high-performance badminton programme only funded players when they reached a certain level. It was highlighted that the majority of high-performing UK badminton players come from a middle-class of wealthy family background; it was suggested that if a player came from a background that had the money to support the player they could progress to a certain level. The lack of funding in the UK badminton structure could be seen as a weakness and as such is likely to be reflected in the difficulty the UK faces in achieving international success. This is thrown into sharp relief when the UK's set up is compared to that of China, where their clear structure and strong system is one of the reasons China has so much international success.

One of the other themes to emerge were the key concerns in both countries' badminton programmes. It was highlighted that one of the key concerns in the Chinese high-performance badminton programme was that players spent more hours developing their badminton skills at the expense of their education. The system was seen to be restrictive in terms of its overwhelming focus on badminton development rather than giving some focus on a player's education, or as importantly, the athletes transition when they stop playing at the highest levels. There were different concerns in UK high-performance badminton. There is a lack of performance training centres throughout the country with limited access to guaranteed quality professional coaching only being available in a few cities. This

appears to be reflected in the limited growth and strength in the depth of the pool of talented youngsters available for the UK high performance programme.

7. Discussion

This chapter will discuss the implications of the findings from the document, quantitative, and qualitative studies. This chapter will also restate the results and relate the results to the literature review, critically assessing the limitations of this study in the light of the research objectives.

7.1. Common Characteristics of World-class Badminton Players

The main driver behind identifying talented children or players is the desire to develop them into future champions and/or word-class players (Scottish National Development U12 TID 2010; Badminton England 2009). The documentary analysis shows that badminton is considered to be a high skill, dynamic sport (Wang and Sheng 1995). From the questionnaire results (Figure 19) the elite badminton players are considered to possess considerable physical capacity, tactical badminton thinking, well-developed technical badminton skills and individual innate attributes that could be classed as intangible. The qualitative research investigated this further and the coaches involved in the research, supported the results of the documentary analysis. For example, Bowmen considers that there are three factors which help to identify world-class players: favourable genetic differences between them and other players, a good development environment, but most of all the willingness of the player to work hard. Coaches Lao and Lio believe that the key characteristics of a world-class player are 65% willingness to work hard, talent 30% and a number of smaller factors making up the balance to 100%. Lao separated feedback into what was termed, “internal” and, “external” factors that go into making a top player. External factors included being given the right opportunities to display talent, a good training environment and good coaching. This corroborates with views expressed in the literature review: Syed (2010) environmental factors can help shape the potential, for example, the high altitude area Nandi in Kenya has produced a lot marathon runner, in this town children would run to the school everyday up to 20km each way. Lao went on to describe internal factors including the individual’s capacity for physical development, a degree of innate ability and a willingness to work hard. In their view a player’s desire to

work hard can make a significant improvement in their performance. Lou considered that a world class badminton player needed a single-minded desire to excel in the sport as it is different from many other sports that are judged against such criteria such as time and distance. Badminton is a competitive game that combines a number of skills, it could, in their view, be considered an, "art", it requires quite advanced tactics like you would find in chess, and also like chess it requires the player to think a number of steps ahead. The coaches involved in the research consider that a player can, with the requisite training and development take these nascent abilities and improve upon them if postulated start at a young enough age. There were other coaches interviewed who had a different perspective in this area. GB coach B (who wishes to remain anonymous) and Wei consider that great players are born with something special, and those players who are not, no matter how hard they train will never be as good as those who are – subject to similar training and development opportunities.

The questionnaire results also highlighted that the players questioned considered that elite badminton players had a number of important characteristics that differentiated them from others. These included mental toughness and well-developed tactical awareness. Additionally, the data collected found that world-class players were able to sustain a heavy workload of training; it is entirely possible that having the traits of mental toughness, self-belief, and the motivation to succeed were primary drivers for this. Syed (2010) noted that in complex sports, such as badminton, a successful performer was more determined by solid practice and not their genetic make-up. The countervailing opinion expressed by Wang *et al.* (2005), reflecting what Coach B and Wei had noted, was that world-class players were born with innate talent, which made a real difference in major tournaments. It has been noted on a considerable number of occasions that top-class players have been able to perform well and either met or exceed their pre-tournament expectations. This type of player has been able to produce quality shots time after time, placing them where they want especially during tense periods of play. This, Coach B and Wei postulated, was down to the player's self-confidence or their ability to control their feelings during periods of tension in the match.

This supports the arguments of Wang *et al.* (2005), who note that the player's psychological and personal development skills have a larger part to play in the player's success as opposed to training. They also highlight that there were a few intangible aspects

to a player's make-up that allowed them to maximise their opportunities to exploit their technical and tactical skills during a match. They therefore consider that the core differences between a world-class player and a less capable player are their individual genetic attributes, personality, and intelligence.

This also aligns to Moon's (2003) perspective, where they postulated that a world-class badminton player's "talent" is an exceptional ability that is used to deliver outstanding results that, in addition, fulfil their personal goals and ambitions. This study does, however, show that a good training environment and good coaching can have a positive influence on a player's development. It is therefore postulated that combining latent talent with these positive environmental factors could led to optimising the results of the player resource pool available.

7.2. General Observation on TI in Badminton

The majority of the coaches interviewed considered that the ideal age to identify talent amongst prospective players was between the ages of six and nine years of age. The introduction to this thesis highlighted that badminton is a multi-discipline sport and eight senior coaches from both China and the UK stated that hand to eye co-ordination and the ability to be able to learn quickly were important components of TI in badminton. This ability for young children to be able to learn and have underlying sporting ability was highlighted as an important factor in badminton TI by British coach, Lou. Lou also stated that while some children can have the desired physical make-up to play badminton, their ability to learn can impede any potential development. GB coach B considered that a player needs a positive attitude towards the sport and that TI would benefit from some form of sports psychology test for potential young players.

Furthermore, three of the Chinese coaches, Wei, Han, and Lio, highlighted the importance of a looking at a child's build, namely that they were slim and of reasonable height. They looked at the child's family background when trying to determine the child's likely progression in this regard. GB coach B confirmed this when they highlighted the importance in some sports of an individual's height and body composition as these measurements can give a good indication of the most appropriate sport for a child based on these types of measurements. It has been previously stated that there is an advantage in

badminton if a player is of reasonable height. Amongst the top ten players in the world, playing singles, the men's average height is 181.14cm and for the top ten women's average height is 168.75cm (see Appendix V). Normally, without any testing, a child's potential height is based on a comparison with the child's parents and/or siblings. However, in China, as highlighted by Wei, Han, and Lio, they use bone scans on a child's hands and feet to predict a child's likely height when they are fully grown. All respondents acknowledged, however, that no test was 100% reliable in predicting a child's future height.

The evidence from the questionnaire shows that 55% of the elite Chinese players were born in the first quarter of the year. This relative age effect is similar to the results obtained by Cobley *et al*. (2009), where they found that in many sports a disproportionate number of athletes that were born earlier in the year were represented amongst the elite levels of their respective sports. As the survey results set out, the Chinese TI is based on chronological age in terms of the tests conducted on children; therefore there is an advantage and disadvantage on the month of the child's birth, depending if it is at the start or the end of a particular calendar year. It leads to identifying and selecting children who are given the chance for more practice, better coaching, and more support, that in turn is likely to lead to them having more confidence in getting good results in junior tournaments.

However, the results from the British national elite badminton players does not show a relative age effect, as these players have birth dates that are spread across the calendar year. This is explained, in part, by the more natural approach to TI in the UK as it relates to development progress. These results also confirm the work of Cobley *et al*. (2009) in that relative age effect has weight and influence on the performance in an individual sport, only where there is highly structured TI in the programme.

To summarise, it is essential in badminton TI to look at a child's fundamental sporting abilities, their hand to eye co-ordination and the efficiency by which they learn. To augment these factors, identification of a young player's body composition, including their potential height is needed. Although these predictions may not be 100% accurate they should be considered for inclusion as there has been data collected to support the overall validity of this type of approach. Consideration should also be given to identifying a child's personality in terms of their general attitude and mental toughness. As has been

previously stated, Moon (2003) considered that, true, "talent" was an exceptional ability used to deliver ambitions that fulfil personal interests and values under difficult circumstances. It should be acknowledged that identifying and predicting these two additional factors would be difficult. In the TI process it should be recognised that being born in the first few months of any year may have advantages for a child. This has been proven by the results of the Chinese national team.

7.3. TI Badminton in China and UK

Both countries have Talent Identification (TI) in their respective badminton programmes. The aim is the same: to get children with potential into high-performance badminton programmes, however, there are significant differences between the two countries in relation to TI. In China, this programme within sport is supported by the government as outlined by coaches Jiang and Wei. In China, badminton TI programmes identify children aged between six and nine years of age. Chinese coaches (Lu and Jing) decide who they think are suitable to play badminton each year; as well as selection they actively de-select players every year as they know there is always a new talent pool to draw from.

In China, TI takes place throughout the duration of the high-performance programme as was evidenced from the quantitative results that showed every Chinese player went through TI testing. Coach Han stated there were four stages to TI in his view. The first took place when children were around seven years of age and was focused on identifying the child's sporting ability, learning ability and their overall build. Selection at this stage relied upon coaches' experience to make the selection decision. The second stage took place when the child was around 12 years of age, who would already have had around four years of badminton training. The players would be measured and judged by physical and health tests as well as their tournament performance. Selection at this stage would be made by both coaches and sports scientists. At the third stage the players would be between 14 and 16 years of age. At this point, the players would typically have had between four and six years of badminton training. Selection would be based on physical tests and tournament results and the selection process done by the coach. At the fourth and last stage, the players would be over 16 years of age and would likely be national team players. At this stage, selection and de-selection would be based on tournament results. Two of the interviewees,

Wei and Lio, indicated if the process was more robust at the first and second stages then the players likelihood of success would be greater at the later stages of the TI process.

The positives coming from the Chinese TI programme includes structured player selection and de-selection in the different age categories as highlighted by Regnier, Salmela and Russell (1993) and Durand-Bush and Salmela (2001). This allows for the selection of a few, young players with the potential to develop allowing for an increased concentration of both human and financial support per player. There are negatives to this type of programme, as it can be seen as being, "ruthless". Vaeynes, Gullich, Warr and Philippaerts (2008) recommend TID programmes should be interconnected and dynamic and consider individual growth and potential development rather than simply the elimination of young children from the programme.

The document analysis highlighted that in the UK emphasis on sporting equal opportunities allows individuals to move from recreational foundation levels to participation through to the high-performance levels. Therefore, de-selecting children could be a difficult process. It is suggested the system's only limitation is on the player's individual ambition. This was highlighted in the interviews with coaches, where Lou expressed the view that in western countries, with their basis on the equality of opportunity, it is difficult for them to accept the concept of talent development as it can take a long time from identifying it to there being tangible achievements. As a result, the ability of coaches to spot talented individuals becomes very important and in the UK there is much more focus on the nurturing of talent and much less focus on player de-selection as the talent pool is limited. A few of the British coaches interviewed, including GB coach A highlighted Britain's TI programme. It starts at the age of six or seven and goes right through to the ages of 17 or 18. The programme considers a number of factors, including the player's hand to eye co-ordination, agility, flexibility, general body shape, skeletal and muscular structure when looking to identify ideal players. British coach A also stated that an additional tool coaches use to identify children with potential was to determine if their parents or guardians had been involved with badminton, as this would likely have led to the children being taught to play badminton properly from an early age, and that this could give them an early advantage.

In the UK, the TI programme seems to agree with Wolstencroft (2002), who promoted the natural identification methodology based on the principle of gradually introducing young children to different sports in a bid to help to develop generic athletic abilities. In this approach, as progress is made, involvement levels are increased in specific sports and so too are the technical and supplementary training associated with the sport.

Overall, the data collected showed that in Britain the TI programme works at different ages to identify players with potential and that as a result there is not the structure as it exists in China and some of the British national players have never been through any form of talent identification, as shown in Figure 16. TI programmes are still relatively new in Britain and as a result, most players' progression and development is judged on tournament results and coaches' instincts. This favours players that are more physically mature; it also favours those players that have entered more tournaments and have gained both experience and ranking points. This leads to a potential gap in that the player may have missed out on skills development (Wang and Sheng 1995). In contrast, in China there are many different tests to spot talent and the supporting systems appear more structured. The Chinese consider it essential to have different tests for players of different ages as players' growth and development differs by age. In this way they consider the tests more relevant and efficient. They also merge TI with the coaches' experience, observations, and instincts for the identification of talent. It is in these respects that the Chinese consider their TI programme is much more advanced than that of Britain.

7.4. Early Specialization and Player Development

As has already been mentioned, 10,000 hours or the equivalent of ten years of practice can lead to excellent performance (Ericsson, 1993). Coach Han considers badminton to be a very skilful sport, requiring the player to put in many hours of training to become an excellent performer. Coach Bowman considers that it is more than just the 10,000 hours or ten years of practice that is required but also the quality of training for a successful player to emerge, an opinion supported by Han and GB coach B, who indicated that some exceptionally talented individuals do not necessarily require this amount of training and that as a result could become an exceptional international player in six to eight years with the right quality of training.

The hypothesis is that if a child started specialised training at the age of six and followed the ten year or 10,000 hour rule of having a quality training programme, they could, by the age of 16, become a top international badminton player. There is evidence for this when considering the player, Ratchamk Intanon from Thailand who, at the age of 17, became world champion. The majority of Chinese players start playing badminton from the age of seven, with every player specialising in badminton, if they are successful in the TI process, by the age of 12. Conversely, UK children specialise in badminton at an older age, on average as established by the questionnaire (Figures 11 and 12).

GB coach B highlighted the concerns of the Scottish badminton programme in terms of requiring players to specialise by the age of 13. This concern is related to the issue that in British society children have many different activities competing for their time; these include activities that are both sports and non-sports related. If adults pressure children from the age of six to give up other activities and just concentrate on badminton, it is very unlikely that they will succeed in their quest. This issue has resulted in British badminton not getting badminton players at a young enough age that have built up a considerable number of hours training by the time they are of an age to compete at an international senior level. This leads to British players' world rankings always being behind those of their Chinese counterparts, as set out in Table 12.

Chinese badminton players by both starting to play at an early age and specialising in badminton have benefits in terms of "economic motives", such as economies of time and money (Gullich and Emrich 2006). Chinese children start at an early age, focus on the one sport, train both for long periods of time and at high intensity, and participate in competitions (Baker, Cobley and Fraser-Thomas 2009). This leads to Chinese badminton players being more mature in their game play and doing well in international competitions all at a much younger age than their British equivalents.

Another important factor that has had a significant impact in making Chinese badminton players having higher world rankings than British players was established by the questionnaire. Chinese badminton players spend considerably more time training and from a younger age than British players (Figure 12). This result is further supported by some of the interviews with coaches (Wen 2014). In China, players aged from six to eight years are training ten hours per week, between the ages of 10 and 14 they are training 18 to 22 hours

per week, and from the age of 14 to 18 years of age, 25 to 30 hours per week. As explained by coaches Lao and Lui, over the age of 18, players are training 10 to 15 hours per week mostly on advanced techniques and time spent on weight and fitness training. At the outset, training is concentrated on skills and techniques, then training gradually increases in intensity. For a female player this is usually around the age of 13 and for a male player, 15. One coach identified the principle of training, for young players training was high in volume but low in intensity, conversely for older players training should be intense, be high in quality but for a shorter duration (Luo 2015). This explains the results in Figure 12, which shows that for Chinese players over the age of 20 that the number of training hours is reduced. Before the age of 20 Chinese players have built up many training hours on skills and techniques such that once they are in their 20s their training is for shorter periods but focused on maintaining and refining their techniques.

When compared to the views of the British coaches on training hours, those of the Chinese coaches are quite different. British coaches all mentioned that training hours and intensity depended on an individual's growth, progress, and development (GB coach A, GB coach B and Bowman 2014). It was recognised that badminton was mostly an individual sport, hence the training was more straightforward to justify at a rate the individual required.

The Chinese badminton system is well-established, restrictive, and quite ruthless. Players specialise in badminton at a young age and train for many hours, therefore young players do not have much time to do other activities. Young Chinese players become professional at a relatively young age, as a result the Chinese dominate the world rankings. Chinese players by the age of 20 and over have dropped their rate of training and duration and many either withdraw or retire early from badminton compared to players in Britain (Figures 10 and Table 11). This early specialisation, focus on a single sport and the intense training associated with early specialisation often leads to young players losing interest, burning out or getting injured that can ultimately lead to Chinese players withdrawing from their chosen sport (Baker, Cobley and Fraser-Thomas 2009). British badminton development is done on a much more individual basis. The age at which a player both starts and specialises is dependent on that individual's interest. The training duration and intensity depends on the individual's growth and development. Therefore, although the British players are not ranked as highly as their Chinese equivalents they tend to keep playing when they are older and often have a longer playing career (Figure 10).

7.5. Opportunities and Concerns for the UK and Chinese Badminton High-performance Programmes

Badminton training costs can be reasonably high. The similarity of both high-performance badminton programmes is that they are funded by government and the goal is to achieve medals in the major sport events. The comparison of the two systems highlighted that in the UK, sport funding is directed to the individual athletes who show potential to win a medal, but the question is how the youngster gets to the point where they can show the potential to win a medal? It takes a long process of development, then the parents have to support their children to get to that level to gain the sport funding to continue their sporting development. The difference in China is that funding in the programme is from the beginning with young children learning badminton until they develop to the elite athlete level. As long as they are in the programme they enjoy the benefits of funding. In China, if a child is selected for a high-performance squad most of the costs are funded by the government. In China, most athletes comes from average income families; it was noted by coach Bao that if an individual has potential there is no concern about the costs for the parents as the sports council will take care of all such costs. Recently, however, coach Lu noted that these provisions in China have changed a little. In the early stages if a child wishes to learn badminton the parents have to pay the coaching fees that are very affordable. If the child demonstrates real potential the government would take care of all their badminton-related costs until the player retires or in any other way chooses to leave badminton.

In Britain, badminton is a relatively accessible sport as most schools have either a badminton hall or at least a badminton court marked out with badminton equipment available (Bowman 2014). When a child first starts training the cost is quite affordable, however, as noted by GB coach A, when a player decides to pursue the performance badminton route the cost increases. To alleviate this, coach Bowman highlighted how, if the child has the potential or does well in tournaments, then there are often grants available. However, during the interview with British coach A, they highlighted parents' concerns that it will cost a considerable amount of money to help a young player reach a high level in badminton. This is likely to be one of the main reasons that British players, when interviewed, considered that family influence had a considerable bearing on their sporting career; 95% of them recording it as "very important" (Table 13 and Figure 16). In Britain, most players come from middle or upper-middle class families and therefore their families

can afford to support them (GB coach A and B 2014). Therefore, a child from a poorer background, even with potential to be a good player, would find it difficult to pursue a professional badminton career.

Fisher and Borms (1990) identified two approaches to talent development: 'systematic' and 'asystematic'. The Chinese high-performance programme follows a systematic approach which can appear oppressive with higher demands and results expectations being placed on players from the earliest stages of development. In Britain, by comparison, the high-performance programme is asystematic with a more natural and individualistic process from the beginning until the latter stages in the players' pursuit of excellence on the world stage. Therefore, there are considerable social and family influences on a player's development in the sport (Wolstencroft 2002). As a result, some children from poorer backgrounds in Britain could miss out on the opportunity to become a professional badminton player as only middle class and upper-middle class families can afford to provide the required support for their child under the current system in Britain. This could be construed as being unfair by an outside observer.

There is a similar issue in China where there is a question mark over equal opportunities to access high-performance badminton. Only selected children get free, high quality coaching and high-performance development. All other children cannot even get into the system. Selection and de-selection is based on test results and tournament results but both sets of decisions are made by coaches. This is likely to be one of the reasons Chinese players view their coaches' influence in their sporting career so highly (Figure 16).

Another concern expressed by Chinese coaches was in respect to their player's aftercare. As a result of players in China starting to train at an early age and for considerably longer hours than their British counterparts coupled to the very rigid system they operate within, players need to give up normal academic study to concentrate on sport. As noted in interviews with Han, Wen, Lu, and Lao, this leads, in many instances, to players having a lack of knowledge outside of badminton that can cause difficulty when the player retires from badminton and transitions to another career or any other way of making a living. It was suggested by Han and Lu that one way to address this was to have an organisational structure to look after players that were about to retire or those who had suffered an injury that prevented them from continuing to play at the highest levels.

There were different concerns expressed by the British coaches. In Britain, there is not the club structure that exists in China (GB coach B 2014) therefore the junior programme relies upon government funding. However, the majority of the funding the government provides is for the senior elite high-performance programme as it appears they are looking for quick results and therefore do not have a long term commitment to the junior programme (Lou 2015). There were also concerns expressed that the national training centres were only in Glasgow and in Milton Keynes, as it was perceived that this led to many badminton players dropping out when they go to university as they often face a long distance to travel to training (GB coach B 2014). GB coaches A and B felt that if there were development centres across Britain it would provide youngsters with greater opportunities for badminton training that would lead to a greater pool of potential talent that could be playing at a higher international level.

7.6. Academic Education and Opportunities for Badminton Players

There are always concerns for professional badminton players and their academic education in China (Han, Wen, Lao, and Liu 2014). Chinese players need to set aside a consistent and relatively high number of hours to train from a young age to allow them to play in world ranking tournaments to secure the high world rankings they have. All of the Chinese coaches included in the research felt it is extremely difficult for any player to combine both what is in effect full-time badminton training with normal full-time education in China. This situation is compounded by the structural set-up in China, where there are many sports boarding schools for talented young athletes, available from the age of 12. By the age of 14 many players would see a reduction in their hours of academic studies to allow an increase in the hours available to train (Lao 2014). Figure 15 shows that 70% of Chinese players come from sports schools that means that within this system the players have less time available for academic study as they spend more of their time on badminton training and recovering from training and any injuries sustained from it. The results from the questionnaire also shows (Figure 12) that players aged between 11 and 15 were spending 18 hours per week training. Therefore, in China most under 15 years of age badminton players are not in what could be termed full-time education and as a result when players retire from their professional career they lack a solid academic background and find it difficult to find alternative employment (Wei 2014).

British badminton coaches think differently. The majority of those interviewed believed that a full academic programme and badminton training could be combined (GB coach A, GB coach B and Bowman 2014). In Scotland, for example, the Glasgow School of Sport has a badminton programme. Children in this school do spend less time on their academic studies than other children of their own age to allow them to spend time on badminton training. The Glasgow School of Sport's structure has been in place for just over ten years and thus far has had some success with many Scottish national players coming from this programme (Bowman 2014). The Scottish national squad's Glasgow players have benefitted from a range of academic opportunities with around 80% of them gaining a university degree. In Wales, similarly there are many opportunities for the players in Cardiff. In England, the situation is more difficult as whilst there is support for many sports at Loughborough University, Bath University, Leeds University, and Beckett Carnegie Universities, the English elite badminton squad is based in Milton Keynes. As there is no university in Milton Keynes it makes it difficult for an English national squad player to maintain their further education (Lou 2015). Within the British education system, when a badminton player reaches the age they could go to university there is some flexibility such that, depending on the course and the amount of study required, some players are able to study part-time or do distance learning (Bowman, GB coach A and GB coach B 2014). GB coach B expressed some concern that if a player wanted to do well at world level they would need to play in 15 to 25 tournaments per year, all around the world and that at some point combining being a full-time player and studying full-time would become difficult.

The system in China is such that from the age of 16 players become full-time with no academic education during this phase of their career; this is why the training hours for Chinese players are much more than their British equivalents, as is evidenced from both countries' responses in the quantitative study. A major concern for every Chinese player should be what kind of future they will face when they retire from professional badminton. GB coach A considered that a greater emphasis on academic study would be good for players as they would have another interest and it would provide a different focus for the player that could act as a relief from the intensity of badminton training. More importantly, would be that when the player retires from the professional ranks they would more readily be able to transfer these skills to their new career.

7.7. Summary

British badminton development relies heavily on volunteers and parents in the initial stages, as identified with models of development cited by Bloom (1985) and Cotes (1999). The broad base aims to develop a life-long engagement in sport and physical activity, as opposed to developing champions and can have, by the way it is structured.

This is in stark contrast with the approaches used in China. Children are selected at earlier ages and are fast-tracked into schools of sport which provide focused talent development programmes which centre on producing champions rather than a broad-based participation and life-long engagement in sport and physical activity. It operates a ruthless selection and de-selection policy, with little attention on exit strategies and careers after professional sport. There is a high volume of wastage and drop out. This highly focused and controlled approach to developing talent seems to work in one respect, in terms of producing medal winners at Olympic Games and World Championships, but there is likely to be a cost to the athletes' futures in this structure. The two countries have quite different sporting systems and environments, with negatives and positives in both. This requires a close examination of the natural development model against the single-state led pathway system operating in China.

From the investigation, key themes have emerged highlighting significant differences between the Chinese and British systems in terms of talent identification and development. Each has its own weaknesses, but also strengths too. Some commonalities arose as well, particularly of money which has and is being spent on national high-performance programmes (Shah and Shankar 2001). Successful Chinese badminton players obtains funding through the Chinese government who support badminton from the initial stages to elite level. However, there are many concerns in the programme. One of the concerns expressed by the Chinese coaches interviewed centred on the lack of academic provision whilst players pursued professional badminton careers. The programme focuses solely on sports performance. This has produced notable successes but, as discussed, is likely to have negative consequences for some players.

British badminton, with a natural development programme, seems to place a greater importance on academic study, but GB coaches highlight a lack of training centres or performance training centres through the whole country. Geography may limit

opportunities. There are a finite number of places available at each centre. The small number of centres places an even greater restriction on opportunities available. Funding is prioritised at the elite end of the performance pathway resulting in very limited provision for those lower down. In the initial stages this places a far greater reliance on parental and family finance and support than their Chinese counterparts.

Another theme which arose as a result of the different approaches, were the relative successes and longevity of athletes. Chinese players reach higher performance levels much earlier than British players due to increased training and competitive opportunities. However, early specialization also leads to early withdrawal or retirement as evidenced by the age profiles of the two nations.

China and Britain both acknowledge the importance of psychology, mental toughness and attitudinal attributes when identifying talent. This may to some extent be down to numbers. China has more players to select from whereas the British system to some extent operates a natural selection process.

8. Conclusions

This chapter aims to provide an overview of the study, summarising and concluding on the key findings of the research as well as highlighting future areas of research. The research illustrated the important skills and attributes required to be a world-class badminton player. It was widely acknowledged that any player wishing to become world class needed to make a commitment to regular practice and that practice must be deliberate and of high quality. Players need to learn and respond to training and instruction. At certain points training can be very intense and in many cases repetitive. A sustained commitment to this is required to produce consistent results in elite badminton.

Top athletes recognise that this commitment requires certain mental and attitudinal strengths. It needs unique attributes from an individual's character and personality. It requires psychological skills such as mental toughness, self-belief, commitment, effort, discipline to sport and making the appropriate sacrifices, self-awareness. coping with pressure, goal-setting, imagery, planning and organization skills, quality practice, realistic

performance evaluations. Endless amounts of motivation and determination alongside those intangible psychological skills help athletes maximise their technical and tactical skills in tournament play. Even if some of these attributes can be identified early in young children, they still require training and development to reach the top.

China operates a systematic approach to talent TID. There is a clear structure and pathway to be adhered to. Conversely, the British approach is asystematic, with limited resources for talent identification; this study shows that many players in the national programme did not go through a TI process. Perhaps for some of the older players this system never existed and this will change over time as the programme was introduced to the UK relatively recently, with the main purpose of tracking young children rather than selection and de-selection. At some stages fitness testing and coaching observations are undertaken. This is more so for identifying strengths and weaknesses rather than selection or de-selection, which is prominent in the Chinese system.

This is one of the fundamental differences between the Chinese and British programmes. China uses talent identification for selection and de-selection purposes. These decisions are based on the rationale of trying to produce future champions in elite badminton. It is possibly more ruthless and attempts to focus available resources and minimise wastage (Wang *et al.* 2005). In Britain TI is used to try and attract more potential youngsters into programmes. It acts as more of a guide to where individuals are placed at that moment in time and further consideration can be given as to when best to accelerate an individual's development route (Bailey and Morley 2006).

This research has found a degree of consensus about the attributes required for elite badminton, which can be identified in young children. These include: speed, agility, flexibility, sport vision eyesight, and mental toughness. The Chinese coaches believe predictions of adult height are important too, which is why bone scanning is included in the battery of talent identification tests carried out in the Chinese system, despite only 25% of Chinese athletes suggesting this is an important attribute for the elite badminton player. However, it is not as simple to list the tests which each country should follow as the resources available differ widely between countries. Nevertheless, it also highlights the importance of various cognitive abilities as well as the physiological components mentioned. According to the players surveyed it is even more important to identify and

recognize intangible psychological skills when helping coaches identify players with potential to succeed. This is reflected in both countries as the talent identification process relies on coaches' observations first and foremost with secondary significance applied to fitness testing results. This assumes that the coaches look at these attitudinal and psychological elements rather than technical and tactical ability and fitness and tournament results when making their assessments. Some tests are more feasible than others. Predicting future height is very difficult and by no means guaranteed, but this does not mean it should be ignored, as some people believe an appropriate height is advantageous.

The research has shown that when TI is heavily relied upon in the badminton programme, it improves future success, and through the relative age effect, which is caused by early stage TI, shows children with an early month of birth have much greater likelihood of future success at the international level. As a result of this study it could be suggested that if the UK badminton introduce a TI system in their programme in its early stages, and develop more systematic identification and development structures, therefore taking into account the greater development of children born in an early month when considering potential.

Finally, talent identification processes act as a mechanism to attract individuals with potential into high performance programmes. It does not mean these players will make it at the top level of international badminton. It is merely the first step onto a performance programme, before a long journey of sustained training and development. Alternatively, the tests involved in various talent identification processes can be seen as a way of detecting strengths and weaknesses, which should be used to influence training programmes.

This research indicates a number of differences between the British and Chinese systems. None is more apparent than the approach to specialisation and volume of training. The data gathered shows Chinese children specialise at an earlier age than the British players. It also shows the Chinese players complete more hours of training in their youth. Although British children started playing badminton at an early age, they also participated in other activities and did not specialise in one sport. As a result the British players completed fewer training hours than the Chinese players.

It has been highlighted that early specialisation in badminton can be the start of a route leading the individual to high-performance sport (Wang and Sheng 1995). The research would concur with this as the Chinese badminton players reach the world stage at a younger age and achieve better world rankings than British counterparts. The review of literature, coaches, and players all indicate success in elite badminton only occurs after many years of high quality practice. Existing research highlights for an individual to achieve exceptional performance in any domain it requires ten years or 10,000 hours of practice (Baker 2003; Ericsson, Krampe and Tesch-Romer 1993; Baker, Cote and Abernethy 1993). Therefore, arguably the Chinese athletes achieve this quantity and quality of training earlier than British players because they specialise earlier in one activity. It would appear they also benefit from a rigid structure which focuses on delivering success. A lot of sacrifices appear to be made, such as education, not taking part in a wide range of activities, whilst young British players seem to enjoy a range of activities for a longer period of time, before starting to specialise in badminton. Arguably, the British system is seen to be more liberal or on the other hand, particularly from a western cultural viewpoint, the Chinese system might seems cruel.

The coaches interviewed highlighted that in Britain it is very difficult to get children to specialise in badminton at a very young age, as there are too many attractive activities for children to become involved in. Furthermore, coaches believed that if players did specialise earlier in Britain these players might end up resenting badminton and withdrawing. This results in British badminton players participating in badminton at lower levels and in smaller quantities; it is more of an interest or past-time than a career path. Consequently, British players still continue to increase the volume of training between 18 to 20 years of age and over, as they have not yet fully developed, so they are probably in the latter stages of the (Bayli 1999) long-term athlete development model. Whereas the Chinese players will be slightly further ahead in their development and will be in the final stages of the model, training to compete and training to win (Bayli 1999). This is shown with the Chinese players reducing quantities of training, focusing on quality, intensity, and competition. However, the Chinese system whilst having some benefits in terms of early specialisation and high amounts of training, it is not without flaws and is not likely to be culturally acceptable in all of its forms within the GB system.

However, the results are clear, more Chinese players achieve success in badminton than British players. Part of this can be attributed to the systematic approach, volume of training and quality of environment. There are likely to be other social and cultural factors too. But if GB badminton wants to compete at the highest levels of international badminton, this research suggests it will need to take a different approach based on earlier specialisation and greater volume of training.

The research shows that neither system is perfect and both have their limitations and disadvantages. In Badminton GB there is not a system which selects and de-selects children into the programme. TID is used as a way of developing the player base and encouraging players to take up badminton, more in hope that they will become excellent rather than with some expectation that they can be the very best. Mostly, the Badminton GB system has a problem with the number of players. There are not enough players in badminton from which to select and de-select from. It almost relies on natural selection. Secondly, funding for badminton is limited. Without support some children from less advantaged backgrounds face barriers, which restrict their progress and development. Following a performance route is expensive and this is beyond the means of many families. Thirdly, British badminton programmes have a lack of regional training centres from which to develop players for the national centres. Without these centres, players probably need to live relatively locally to the national centre, or they incur lengthy travelling distances or train in weaker environments. Britain needs additional regional performances centres, ideally placed in major cities and ideally within schools or universities. Players experience many transitions in different aspects of their lives. As well as those sporting transitions associated with badminton, another key area in young people's lives is education and employment.

In China, badminton players are selected into sports school from the age of 12 years old. Players undertake less academic study to ensure the volume of training increases, the quality of training remains high and suitable rest and recovery takes place. At 16 years of age selected badminton players become professional athletes, with training hours continually increasing, resulting in withdrawal from academic study. This is short-sighted, as most of the athletes will require employment after their badminton career has finished. Elite sport is fraught with risks and dangers and not having an academic education to fall

back on is a significant weakness in the Chinese system. It would be to the benefit of the vast majority of athletes if this could be reviewed.

The Chinese system invests considerable resources into the chosen and children and senior players. Providing high quality coaches and training environments, even supplies for food and accommodation. Providing this level of support, with public monies, so far out from success would be unthinkable in Britain. UK Sport invests up to circa £30,000 per annum in top athletes through the World Class Performance Programme Athlete Personal Allowance (APA) awards. This level of funding only goes to podium level athletes, who have a realistic chance of medalling at the next Olympic Games.

8.1. Researcher Thoughts

The research has highlighted a number of areas that are worthy of further research in order to establish viability and acceptability. Badminton China should investigate the feasibility of its system being able to develop, instead of immediate de-selection or elimination and encourage continuation in academic education and discourage withdrawal from studies. Establishing whether academic studies could be lengthened to allow badminton training and competition to sit alongside study would be worthwhile. In line with this, Badminton China should consider the introduction of a lifestyle support programme to help athletes through key moments in their lives, particularly exiting from professional sport. This appears to be paramount given the 'wastage' of athletes from the TID programme with no skills to help with future education and employment.

Badminton GB should investigate the possibility of increasing the number of regional performance centres, enabling more athletes to access performance programmes, closer to their home and educational environments. At some stage players need to choose or potentially compromise choices within education or employment and their badminton career. Potentially, more local regional centres allow more choices for players to access a high quality training environment closer to where they live, reducing costs and allowing players to combine playing with education and employment in a more successful manner.

8.2. Limitations and Further Research

There are a number of limitations with this study. Firstly, it has tried to investigate TID, which as a subject is too broad. Research focused on one part of the pathway, either TI or TD, permitting deeper research, might have created a more meaningful impact. However, breadth has allowed this work to investigate a complete process. Secondly, undertaking a comparative analysis between China and the UK by nature will unveil a lot of big differences as the countries are so different. Smaller more marginal gains may have been identified if alternative countries had been chosen. China and the UK were selected for logistical pragmatic purposes, in addition to existing contacts and access to subjects within the scope of a self-funded MPhil study.

This study has made some interesting findings, but there are many more connected areas that would be worthy of further research, some of which includes:

	Question
Early specialisation	What consequences does early specialisation have on the psychological and physical health of Chinese badminton players?
Selection process	What impact does frequent selection and de-selection have on badminton participation? Does the Chinese system allow for lifelong engagement in the sport outside of those selected for the performance pathway?
Funding	The British system requires players to rely heavily on parental funding. How much financial support is required to support their child to become a professional badminton player? Does this create barriers and exclude certain socio-economic groups?
Development	How do badminton players develop and progress in different countries? For example technique, weight training, and speed training.
Retirement	What are the second career opportunities for retired badminton players? How should badminton players be supported to prepare for a career after professional sport? Could national governing bodies further encourage dual careers (study and sport) especially during the developmental stages of their careers?

Table 13 Further research and question.

8.3. Summary

Overall, both Chinese Badminton and GB Badminton have the same goal in their high performance programmes, that is to secure medals in major championships and games. Both countries have sport systems that have significantly different approaches to TI and TD. Both TI and TD are vital tools in any high performance development programme; TI to recognise potentially high-performance players, and TD to develop that potential to an elite level. This study has shown that the Chinese Badminton high-performance programme is very rigid and structured, whilst the GB Badminton programme is far more fluid and has more wide ranging development aspirations. Both countries approaches to TID have their merits.

9. References

ABBOTT, A. and COLLINS, D., 2002. Theoretical and Empirical Analysis of a State of the Art Talent Identification Model. *High Ability Studies,* vol. 13, no. 2, pp. 78- 157.

ABBOTT, A. and COLLINS, D., 2004. Eliminating the Dichotomy Between Theory and Practice in Talent Identification and Development: Considering the Role of Psychology. *Journal of Sports Sciences,* vol. 22, pp. 395-408.

ABERNETHY, B., 1988. The Effects of Age and Expertise Upon Perceptual Skill Development in a Racquet Sport. *Research Quarterly for Exercise and Sport,* vol. 59, pp. 210-221.

ABERNETHY, B., 2008. Introduction: Development Expertise in Sport – How Research Can Inform Practice. In V eds., *Developing Sport Expertise,* Abingdon: Routledge.

ABERNETHY, B., COTE, J. and BAKER, J., 1999. *Expert Decision Making in Sport*. Canberra: Australian Institute of Sport Publication.

ALABIN, V., NISCHT, G. and JEFIMOV, W., 1980. Talent Selection. *Modern Athlete and Coach*, 18(1): pp. 36-37.

AMUSA, L.O., TORIOLA, A.L. and DHALIWAL, H.S., 2001. Anthropometric Profile of Botswana Junior National Badminton Players. *Journal of Human Movement Study,* vol. 402, pp. 28-115.

ANITA, E.P., MANIE, J.S. and HENDRIK, S., 1997. Identifying and Developing Rugby Talent Among 10-year-old boys: A Practical Model. *Journal of sports sciences,* vol. 1998, no. 16, pp. 691-699.

BADMINTON AUSTRALIA, 2008. Talent Identification - the Search for Our Future Sporting Heroes. [Online]. Available at: http://www.badminton.org.au/index.php?id=160 [Accessed 9th April 2011].

BADMINTON ENGLAND, 2009. Performance Pathway Documents Raw TID Tool. [Online] Available at: http://www.badmintonengland.co.uk/404.asp#.VSADPykk_dk [Accessed 9th January 2011].

BADMINTON ENGLAND REGIONAL, 2009. Yonex All England Badminton Championships, Legacy Development Programme 2009-2013, Annual Action Plan 2011.

[Online]. Available at: http://www.allenglandbadminton.com/2012docs/LegacyPlan1-4.pdf [Accessed 9th April 2012].

BADMINTON ENGLAND, 2009. *Regional Plan 2009 – 2013*.

BAILEY, R. and MORLEY, D., 2006. Towards a Model of Talent Development in Physical Education. *Sport Education and Society,* vol. 11 no.3, pp. 211-230.

BAKER, J., 2003. Early Specialization in Youth Sport: A Requirement for Adult Expertise? *High Ability Studies*, vol. 141, pp. 85-94.

BAKER, J., HORTON, S., ROBERTSON-WILSON, J. and WALL, M., 2003. Nurturing Sport Expertise: Factors Influencing the Development of Elite Athlete. *Journal of Sports Science and Medicine,* vol. 2, pp. 1-9.

BAKER, J., COBLEY, S. and FRASER-THOMAS, J., 2009. What Do We Know About Early Sport Specialization? Not Much! *High Ability Studies,* vol. 20 no. 1, pp. 77-89.

BALYI, I., and HAMILTON, A., 1999. Long-term Planning of Athlete Development, The Training to Win Phase, *FHS, The UK's Quarterly Coaching Magazine*, no. 3, pp. 7 - 9. [Online] Available at: http://www.sportdevelopment.org.uk/balyibc2001.pdf. [Accessed 5th November 2012]

BARBUTO, J.E. and WHEELER, D.W., 2002. Becoming a Servant Leader: Do You Have What It Takes? *NebGuide G02-1481-A*. Lincoln: University of Nebraska.

BARNSLEY, R.H. and THOMPSON, A.H., 1988. Birthdate and Success in Minor Hockey: The Key to the NHL. *Canadian Journal of Behavioural Science,* vol. 20, pp. 167-76.

BARNSLEY, R.H., THOMPSON, A.H. and BARNSLEY, P.E., 1985. Hockey Success and Birthdate: The RAE. *Canadian Association for Health, Physical Education, and Recreation,* vol. 51, pp. 23-28.

BAUM, S.M., OWEN, S.V. and ORECK, B.A., 1996. Talent Beyond Words: Identification of Potential Talent in Dance and Music in Elementary Students. *The Gifted Child Quarterly*, vol. 40 no. 2, pp. 93-101.

BAXTER-JONES, A.D.G., MAFFULLI, N. and HELMS, P.J., 1993. Low Injury Rates in Elite Athletes. *Archives of Disease in Childhood,* vol. 68, pp. 130-132.

BLOOM, B.S., 1985. Developing Talent in Young People. *New York : Ballantine Books.*

BLOYCE, D. and SMITH, A., 2012. Elite sports development: Promoting international

success. In: *Sport Policy and Development.* Routledge Online Studies on the Olympic and Paralympic Games, 147., pp. 132-156.

BOMPA, T.O., 1994. *Theory and Methodology of Training*. Champaign: Human Kinetics Publishers.

BURGESS, R., 2009. *A Review: Talent Identification National Sports Institute of Malaysia*. [Online]. Available at: http://talentidisn.blogspot.com/2009/10/review-talent-identification-by-r.html [Accessed 10 April 2011].

CALLENDER, S.S., 2010. The Early Specialization of Youth in Sports. *Athletic Training and Sports Health Care*, vol. 2 no. 6, pp. 255-257.

CHENG, J.J., 2008. School of Sport Beginning Selection for Badminton Athlete – 16.6.2008 Registered: 1007-62042008.04-0095-01. *China Academic Journal Electronic Publishing House,* 1994-2009. [Online] Available at: http://www.cnki.net [Accessed 16th June 2011]

CHISNALL, P.M., 1981. Marketing Research – Analysis and Measurement, 2nd edition. *McGraw-Hill, Maidenhead.*

COBLEY, S., BAKER, J., WATTIE, N. and MCKENNA, J., 2009. Annual age-grouping and athlete development: A meta-analytical review of relative age effects in sport. *Sports Medicine,* vol. 39, pp. 235-56.

COLLIN, S., BAKER, J. and SCHORER, J., 2012. *Identification and Development of Sport Talent; a Brief Introduction to a Growing Field of Research Practice*. London; Routledge.

COLLINS, M. and BULLER, J., 2003. Social Exclusion From High Performance Sport. *Journal of Sport and Social Issues*, vol. 27, no. 4, pp. 420-442.

COTE, J., 1999. The Influence of the Family in the Development of Talent in Sport. *The Sport Psychologist,* vol. 13, pp. 395-417.

COYLE, D., 2009. *The Talent Code: Greatness Isn't Born, It's Grown. Here's how*. New York: Bantam Dell Publishing Group.

DOLL-TEPPER, G., 2008. *Sport and Olympism; Common Issues, Threats and Opportunities*. Berlin: University of Berlin. [Online]. Available at: http://doc.rero.ch/lm.php?url=1000,42,38,20090903151635-IC/RE_-_G_1_._Doll-

Tepper_-_2008.pdf [Accessed 10 April 2010].

DURAND-BUSH, N., 2000. *The Development and Maintenance of Expert Performance: Perceptions of Olympic and World Champions.* Unpublished doctoral dissertation, University of Ottawa, Canada.

DURAND-BUSH, N. and SALMELA, J.H., 2001. The Development of Talent in Sport. *Canada.* pp. 269-285.

ERICSSON, K.A., 1996. *The Road to Excellence: The Acquisition of Expert Performance in the Arts and Sciences, Sport and Games*. Mahwah, NJ: Erlbaum.

ERICSSON, K.A., KRAMPE, R.T. and TESCH-ROMER, C., 1993. The Role of Deliberate Practice in the Acquisition of Expert Performance. *Psychological Review,* vol. 100 no. 3, pp. 363-406.

EXECUTIVE, S., 2007. *Reaching Higher: Building on the Success of Sport 21*. Edinburgh: Scottish Executive.

FALK, B., LIDOR, R., LANDER, Y. and LANG, B., 2004. Talent Identification and Early Development of Elite Water – Polo Players: A 2-Year Follow-up Study. *Journal of Sport Science,* vol. 22, no. 4, pp. 347-355.

FARROW, D., BAKER, J. and MACMAHON, C., 2008. Developing Sport Expertise: Identifying and Developing Sporting Experts. Routledge.

FELDMAN, D.H., 1986. Giftedness as a Developmentalist Sees It. In: R.J. STERNBEG and J.E. DAVIDSON, eds., *Conceptions of giftedness*. Cambridge: Cambridge University Press. pp. 285-305.

FISHER, F., 1992. Gifted Children and Young People in Physical Education and Sport. In: D. ARMSTRONG, ed., *New Directions in Physical Education: Change and Innovation.* London: Cassell Education, pp. 131-143.

FISHER, R.J. and BORMS, J., 1990. The Search for Sporting Excellence. *Berlin: International Council of Sport Science and Physical Education. ISBN: 978-3-778064-31-3.*

FLICK, U., 2014. The SAGE handbook of qualitative data analysis, Qualitative

FLICK, U., 2014. The SAGE handbook of qualitative data analysis, Documentary method.

FLICK, U., 2015. The SAGE handbook of qualitative data analysis, Analysing interviews.

GRATTON, C., and JONES, I., 2004. *Research Methods for Sport Studies*. Routledge.

GULBIN, J.P., CROSER, M.J., MORLEY, E.J. and WEISSENSTEINER, J.R., 2013. An Integrated Framework for the Optimization of Sport and Athlete Development: Practitioner Approach. *Journal of sport Sciences,* vol. 31, no. 12, pp. 1319-1331.

GULLICH, A. and EMRICH, E., 2006a. Evaluation of the Support of Young Athletes in the Elite Sport System. *European Journal for Sport and Society,* vol. 32, no. 85-108.

GULLICH, A. and EMRICH, E., 2006b. Sport Spanning Training Variability Augments Individual Success Potential in Elite Sport. In H. HOPPELER, T. REILLY, E. TSOLAKIDIS, L. GFELLER and S. KLOSSNER eds., *Book of abstracts of the 11th Annual Congress if the European College of Sport Science.* Cologne: Sportverlag Strauss.

HAHN, A., 1990. Identification and Selection of Talent in Australian Rowing. *Exel*, vol. 6, pp. 5-11.

HELSEN, W.F. and STARKES, J.L., 1999. A Multidimensional Approach to Skilled Perception and Performance in Sport. *Applied Cognitive Psychology,*vol. 13, pp. 1-27.

HOGAN, K., and NORTON, K., 2000. The "Price" of Olympic Gold. *Journal of Science and Medicine in Sport,* vol. 3, pp. 203-218.

HONG, F., WU, P. and XIONG, H., 2005. Beijing Ambitions: An Analysis of the Chinese Elite Sports System and Its Olympic Strategy for the 2008 Olympic Games. *The International Journal of the History of Sport*, vol. 224., pp. 510-529.

HOULIHAN, B. and GREEN, M., 2005. *Elite Sport Development Policy Learning and Political Priorities*. Routledge.

HOULIHAN, B. and GREEN, M., 2008. *Comparative Elite Sport Development Systems Structures and Public Policy*. Routledge.

HOULIHAN, B. and GREEN, M., eds., 2007. *Comparative Elite Sport Development*. Routledge.

HOWE, M.J.A., DAVIDSON, J.W. and SLOBODA, J.A., 1998. Innate Talents: Reality or Myth? *Behavioral and Brain Sciences,* vol. 21, pp. 399-442.

Hubei Badminton strategy plan 2002-2006.

HENG, S.D., 2005. *Chinese Badminton Athlete review for Talent Selection*, *China Academic Journal*, vol. 6, pp. 1994-2009. Electronic Publishing House.

JIAN, C.J., 2008. School of Sport Badminton Athlete Talent Identification China Sports Coaching Post Training Teaching Material—Badminton. *Physical Culture and Sports Commission of the People's Republic of China*, vol. 30 no. 4. pp. 101-110.

LENOIR, A., PHILIPPAERTS, M., VAEYENS, R. and WILLIAMS, M., 2008. Talent Identification and Development Programmes in Sport Current Models and Future Directions. *Sports Med,* vol. 38, no. 9, pp. 703-714.

LI, Y.B., 2007. *The Strategy of Sustainable Development of the Chinese Badminton Team.* Registered: 1007-323X2007.03-001-04.

LIN. J.C., 2005. *Badminton Athlete Selection View of China, 1994-2009*. China Academic Journal Electronic Publishing House.

LOMBARDO, M.P. and DEANER, R.O., 2014. You Can't Teach Speed: Sprinters Falsify the Deliberate Practice Model of Expertise. *PeerJ*, vol. 2, p.445.

MACCURDY, D., 2012. *Talent Identification Around The World and recommendations for the Chinese tennis association.* Talent Identification Around World, [online]. Available at: http://www.itftennis.com/shared/medialibrary/pdf/original/IO_18455_original.PDF [Accessed 7th April 2012].

MARTINDALE, R.J.J., COLLINS, D. and DAUBNEY, J., 2005. Talent Development: A Guide For Sport, *Quest,* vol. 57, pp. 353-375.

MONTGOMERY, D., 2016. The Rise of Creative Youth Development. National Guild for Community Arts Education. Available at:

http://www.nationalguild.org/getmedia/c26bd0a1-948f-4a8f-ad9e-378e0bf38345/Rise-of-Creative-Youth-Development.pdf.aspx?ext=.pdf [Accessed 15th November 2016].

MOON, S.M., 2003. *High Ability Studies*. Routledge: United Kingdom.

365jia.cn, July 2014. *National Badminton Junior Camp 2014 visit at training camp He Fei.* [Online]. Available at: http://edu.365jia.cn/news/2015-07-29/85ED6861098011ED.html [Accessed June 2014].

PELTOLA, E., 1992. Talent identification. New Studies in Athletics. *London,* vol. 73, pp. 7-10.

PHILIPPAERTS, R.M., VAEYENS, R. and JANSSENS, M., 2006. The Relationship Between Peak Height Velocity and Physical Performance in Youth Soccer Players. *Journal*

of Sports Sciences, vol. 3, pp. 221-30.

PIENAAR, A.E., SPAMER, M.J. and STEYN, H.S.J.R., 1998. Identifying and developing rugby talent among 10-year-oldbys: a practical model. *Journal of Sports Sciences,* vol. 16, no. 8, pp.691-699.

PIOTR UNIERZYSKI., 2012. *Tennis Game Patters of World's Top players.* [online]. Available at: http://www.metodickakomise.cztenis.cz/docs/Unierzyski1.pdf [Accessed 8th April 2012].

PORTER, L., 1999. *Gifted Young Children. The meaning of giftedness*. Open University Press.

ROEDELL, W., ROEDELL,W.C, 1980. Gifted Young Children. A perspective on gifted and talented education. Concerning the nature of giftedness P1-6.

RANDAK, L., 1998. Talent Identification and Development in Scottish Sport. *Scottish Journal of Physical Education*, vol. 26 no. 2, pp. 46-59.

REGNIER, G., SALMELA, J.H. and RUSSELL, S.J., 1993. Talent Detection and Development in Sport. In: R.N. SINGER, M. MURPHEY, and L.K. TENNANT, eds., *Handbook Of Research In Sport Psychology.* New York: Macmillan.

SCOTTISH EXECUTIVE, February 2007. *Reaching Higher Building On The Success Of Sport 21. Published by the Scottish Executive.* [Online]. Available at: http://www.gov.scot/resource/doc/169113/0047106.pdf [Accessed 29TH June 2015].

SCOTTISH GOVERNMENT, 2012. *The Population Attending Private Schools.* [Online]. Available at: http://www.scotland.gov.uk/Topics/Statistics/SIMD [Accessed 7th November 2012].

SCHORER, J., BAKER, J., BUSCH, D., WILHELM, A. and PABST, J., 2009. Relative Age, Talent Identification and Youth Skill Development: Do Relatively Younger Athletes Have Superior Technical Skills? *Talent Development and Excellence,* vol. 1, no. 1, pp. 45-56.

SMITH, D. J., 2003. A Framework for Understanding the Training Process Leading to Elite Performance. *Journal of Sport Medicine*, vol. 33, no. 15, pp. 1103-1126.

SMITH, M., 2010. Research Methods in Sport. *Exeter: Learning Matters Ltd.*

SMITHERS, A. and ROBINSON, P., 2008. *HMC Schools: A Quantitative Analysis*.

Carmichael Press.

SPORT COUNCIL., 1993. *Young people and sport; policy and frameworks for action*. London sports Council.

sportscotland INSTITUTE OF SPORT, 2009. ***sport****scotland Institute of Sport Talent Strategy 2009—2016*. [folder]. Edinburgh: Sport Scotland Institute of Sport.

sportscotland (2004). *Sport Scotland Player Improvement—a Consultation Paper on the Introduction of a Long-Term Player Development Pathway, and Its Implications for Strengthening the Infrastructure of Scottish Sport*. Edinburgh: **sport**scotland.

sportscotland, 2015. *Raising The Bar; Corporate Plan 2015-2019.* Glasgow: **sport**cotland.

SYED, M., 2010. Bounce. New York: Harper.

The GB world performance programme 2007- 2012.

UK SPORT, 2012. *Introducing UK Sport* [Online]. Available at: http://www.uksport.gov.uk/pages/about-uk-sport/ [Accessed 5th November 2012]

UK SPORT, 2016. *Historical Funding*. [Online]. Available at: http://www.uksport.gov.uk/our-work/investing-in-sport/historical-funding-figures [Accessed 29th December 2016].

UK SPORT, 2012. *Talent Identification and Development*. [Online]. Available at: http://www.uksport.gov.uk/pages/talent-id/[Accessed 1st November 2012].

UNIERZYSKI, P., 2003. Level of Achievement Motivation of Young Tennis Players and Their Future Progress. *Journal of Sports Science and Medicine,* vol. 2, pp. 184-186.

VAEYENS, R., GULLICH, A., WARR, C.R. and PHILIPPAERTS, R., 2009. Talent Identification and Promotion Programmes of Olympic Athletes. *Journal of Sports Sciences,* vol. 27, no. 13, pp. 1367-1380.

VAEYENS, R., LENOIR, M., WILLIAMS, A.M. and PHILIPPAERTS, R., 2008. Talent Identification and Development Programmes in Sport. *The Journal of Sports Medicine*, vol. 38 no. 9. pp. 703-714.

WANG, J.C., FEN, F.H., BEI, E.B. and QU, J.H., 2005. *China Talent Identification Theory and Methods,* 6. Registered: ISBN 7-5009-2706-1.

WANG, W.J. and SHENG, B.Y., 1995. China Sports Coaching Post Training Teaching

Material Badminton. *Physical culture and sports commission of the People's Republic of China.*

WIERSMA, L.D., 2000. Risks and Benefits of Youth Sport Specialization: Perspectives and recommendations. *Pediatric Exercise Science*, vol. 12, pp, 13-22.

WIKIPEDIA, 2016. *List of Olympic Medalists in Badminton 2016*. [Online]. Available at: https://en.wikipedia.org/wiki/List_of_Olympic_medalists_in_badminton [Accessed 20th June 2016].

WILLIAMS, A.M., and REILLY, T., 2000. Talent identification and development. *Journal of Sport Sciences,* vol. 18, pp. 657-667.

WILLIAMS, C.A., BEST, T.M., ALVAR, B.A. and CRONIN, J., 2014. Long-Term Athletic Development- Part 1. *The Journal of Strength and Conditioning Research,* vol. 29, pp. 1439-1450.

WOLSTENCROFT, E., 2002. *Talent Identification and Development: An Academic Review – A report for SportScotland*. Edinburgh: University of Edinburgh.

Appendix I: Comparison of two countries badminton player month of birth and ranking

*(some ranking of players are doubles or mixed events)

British Players	World Ranking at 2.12.2012			
Ranking	**Player**	**Country**	**Date of Birth**	
			Month	**Year**
7*	Chris Adcock	England	4	1989
7*	Gabby White	England	9	1990
48	Chloe Magee	Ireland	11	1988
25	Scott Evans	Ireland	9	1987
103*	Imogen Bankier	Scotland	11	1987
103*	Robert Blaire	Scotland	8	1981
36	Natlie Chan-Lam	England	2	1996
69	Kerri Scott	England	12	1994
85	Rebekka Findlay	Scotland	1	1994
87	Victoria Williams	England	5	1995
48	Kirsty Gilmour	Scotland	9	1983
58	Susan EGELSTAFF	Scotland	10	1982
78	Elizabeth CANN ~	England	3	1979
97	Nicola CERFONTYNE	England	9	1987
41	Darren ADAMSON	England	5	1994
48	Josh NEIL	Scotland	5	1995
50	Rhys WALKER	England	1	1994
62	Alex LANE	England	8	1995
36	Natlie Chan-Lam	England	2	1996
69	Kerri Scott	England	12	1994

Chinese players				
Rankink	**Player**	**Country**	**Date of Birth**	
			Month	**Year**
2	CHEN Long	China	1	1989
3	LIN Dan	China	10	1983
4	CHEN Jin	China	1	1986
7	DU Pengyu	China	1	1988
12	WANG Zhengming	China	2	1990
1	WANG Yihan	China	1	1988
2	LI Xuerui	China	1	1991
5	WANG Shixian	China	2	1990
7	JIANG Yanjiao	China	6	1986
10	WANG Xin	China	11	1985
18	HAN Li	China	1	1988
23	CHEN Xiao Jia	China	10	1991
3*	Chai Biao	China	10	1990
3*	Hong Wei	China	4	1989
6*	Fu Haifeng	China	2	1984
6*	Zhang Nan	China	1	1990
2*	Wang Xiaoli	China	6	1989
2*	Yu Yang	China	7	1986
9	Ma Jin	China	7	1988
3	Luo Yu	China	1	1990

Appendix II: Badminton World Ranking and Player's Height (23.2.2015)

Women Single			**Men Single**		
Ranking	Name	Height (cm)	Ranking	Name	Height (cm)
1	Li Xue Rui	174	1	Chen Long	187
2	Wang Shi Xian	-	2	Jan o Jorgensen	185
3	Wang Yi Han	178	3	Lee Chong Wei	172
4	Saina Nehwal	165	4	Son Wan Ho	176
5	Ratchanok Intanon	167	5	K. Srikanth	-
6	Sung Ji Hyun	175	6	Lin Dan	178
7	Tai Tzu Ying	163	7	Chou Tien Chen	-
8	Bae Yeon Ju	165	8	Hans-Kristian Vittinghus	180
9	Akane Yamaguchi	-	9	Viktor Axelsen	190
10	Eriko Hirose	163	10	Wang Zheng Ming	-
Average height		**168**	**Average height**		**181**

Appendix III: Cover letter for questionnaire

University of Stirling

Dear Sir

I am a researcher at the University of Stirling, where I am carrying out an investigation into "Talent Development Identification in China and UK". With your co-operation, this study will determine a number of key facts about high performance long term development in badminton. From the investigation it will be possible to find out *what you as a participant value, and whether your needs are being net.* Questionnaire are being given to a selected number of individuals such as yourself, who will provide a representative value sample.

The questionnaire may appear to be quite complex, however it is quite easy and should only take few minutes to complete. There are no right or wrong answers. In most cases it is simply a matter of ticking a box. There are, however, a number of questions for you to say more about certain issues. Please try and answer the question if possible as truly as you can.

The completed questionnaire will be treated with absolute confidentiality. Information identifying the respondent will not be disclosed under any circumstances.

Therefor you should not worry about how your answers. Other parties will not at any time have access to the completed questionnaires. I would be grateful if you could return the questionnaire in the pre-paid envelope provided or hand in back to me please.

Thanks for your time to completed and return questionnaire.

Thanks you in advance for your co-operation. I am looking forward to hearing from you.

Kind regards

Rita.Yuan. Gao

Researcher

University of Stirling

Appendix IV: Questionnaire

TALENT IDENTIFICTION AND DEVELOPMENT QUESTIONNAIRE FOR BADMINTON PLAYERS

The following questionnaire aims to investigate TID methods experienced by current national and international badminton players.

- *Objective 1. To quantify respondent age group and gender. Those two questions allowed research to identify which national team at younger age, as well as enabling make the measurement with other questions.*

1. What is your age? 16-19 ☐ 20-24 ☐ 25-29 ☐ 30-34 ☐ 35+ ☐

2. What is your gender? ☐ Male ☐ Female

Objective 2. To identify the profession of respondents. It would show players commitment on badminton

3. Do you play badminton full time? Yes ☐ (go to question 5) No ☐ (go to question 4)

4. What else do you do alongside badminton?
   Full time employment ☐ Full time student ☐
   Part time employment ☐ Part time student ☐
   Other ☐ If other please specify
   _____

• *Objective 3. To identify world ranking of respondents. It allows research to compare both countries' players stander.*

5. In which events do you play? ☐ Singles ☐ Doubles ☐ Mixed doubles

6. Highest WBF international ranking? Singles _____ Doubles _____ Mixed Doubles _____

- *Objective 4. To group respondent training years. It allows research to compare both countries' players training year of length. Along analysis with question of respondent age group, therefore it is important to have knowledge of age and training years length.*

7. How long have you played badminton for?
   0-5 years ☐ 6-10 years ☐ 11-15 years ☐ 16-20 years ☐
   21-25 years ☐ 26-30 years ☐ 31 or more years ☐

- *Objective 5. Identify the respondent early involvement with badminton. Allowed research to compare both countries' players difference.*

8. At what age did you start playing badminton? _____

9. At what age did you specialise in Badminton as the only sport you played? _____

- *Objective 6. To identify in both countries' national player which were go through the talent identify progress.*

10. Were you ever identified or spotted to play another sport? Yes ☐ No ☐

If yes, please specify which sport(s)_____

- *Objective 7. To identify any players played other sport before badminton. If there are many players do so it might suggested this way would help the further development.*

11. Did you train in any other sport(s) before you started badminton? Yes ☐ No ☐

If yes, please specify which sport(s)_____

- *Objective 8. To identify both countries players pathway. Some player may not been through the sport school programme.*

12. Were you ever in a school of sports programme for badminton? Yes ☐ No ☐

- *Objective 9. To identify players family has any involvement with sports, who may introduce player into sport.*

13. Do any members of your family play sport? Yes ☐ No ☐

- *Objective 10. To identify players any influence on their badminton career, response to this question enable to score, and have the option of ticking one of five possible responses.*

Please rate the importance of the following influences on your badminton career:

	5 Very Important	**4 Somewhat Important**	**3 Neither Important nor Unimportant**	**2 Somewhat Unimportant**	**1 Very Unimportant**
14. Parent	☐	☐	☐	☐	☐
15. Grandparent, Uncle or Aunt	☐	☐	☐	☐	☐
16. Sibling (Brother or Sister)	☐	☐	☐	☐	☐
17. Coach	☐	☐	☐	☐	☐
18. Friend	☐	☐	☐	☐	☐
19. Teacher	☐	☐	☐	☐	☐
20. Sporting Idol	☐	☐	☐	☐	☐
21. Other Please specify _____	☐	☐	☐	☐	☐

- *Objective 11. To identify players training hours per week from different age. This question allows research to training rate different between players.*

22. In a normal training week, how many hours did you train for at the following age groups?

	Number of Hours per week							
Aged 3-8:	0-2☐	3-5 ☐	6-9 ☐	10-13 ☐	14-18 ☐	18-21 ☐	22-25 ☐	25+ ☐
Aged 8-12:	0-2☐	3-5 ☐	6-9 ☐	10-13 ☐	14-18 ☐	18-21 ☐	22-25 ☐	25+ ☐
Aged 12-15:	0-2☐	3-5 ☐	6-9 ☐	10-13 ☐	14-18 ☐	18-21 ☐	22-25 ☐	25+ ☐
Aged 15-17:	0-2☐	3-5 ☐	6-9 ☐	10-13 ☐	14-18 ☐	18-21 ☐	22-25 ☐	25+ ☐
Aged 17-20:	0-2☐	3-5 ☐	6-9 ☐	10-13 ☐	14-18 ☐	18-21 ☐	22-25 ☐	25+ ☐
Aged 20+:	0-2☐	3-5 ☐	6-9 ☐	10-13 ☐	14-18 ☐	18-21 ☐	22-25 ☐	25+ ☐

- *Objective 12. To identify which talent test has player done in the past.*

Have you been involved in any of the following forms of talent identification?

	Yes	No
23. Fitness Testing	☐	☐
24. Medical screening	☐	☐
25. Physiological screening	☐	☐
26. IQ Testing	☐	☐
27. Personality testing	☐	☐
28. Bone density scanning	☐	☐
29. Family background checks	☐	☐
30. Body composition testing	☐	☐
31. Sports vision test (eyes)	☐	☐
32. Badminton skill testing	☐	☐
33. Sports Psychology testing	☐	☐
34. Anthropometric profiling	☐	☐
35. Other please specify_____	☐	☐

- *Objective 13. To identify player's view on the importance which TI test. Response to this question enable to score, and have the option of ticking one of five possible responses.*

In your opinion please rate the importance of the each test in identifying elite badminton players

	5 **Very Important**	**4** **Somewhat Important**	**3** **Neither Important nor Unimportant**	**2** **Somewhat Unimportant**	**1** **Very Unimportant**
36. Fitness testing	☐	☐	☐	☐	☐
37. Medical screening	☐	☐	☐	☐	☐
38. Physiological screening	☐	☐	☐	☐	☐
39. IQ Testing	☐	☐	☐	☐	☐
40. Personality testing	☐	☐	☐	☐	☐
41. Bone density scanning	☐	☐	☐	☐	☐
42. Family background checks	☐	☐	☐	☐	☐
43. Body composition testing	☐	☐	☐	☐	☐
44. Sports vision test (eyes)	☐	☐	☐	☐	☐
45. Badminton skill testing	☐	☐	☐	☐	☐
46. Sports Psychology testing	☐	☐	☐	☐	☐
47. Anthropometric profiling	☐	☐	☐	☐	☐
48. Other please specify_____	☐	☐	☐	☐	☐

- *Objective 14. To identify player's view on the rate of importance of attribute on elite level badminton player. Response to this question enable to score, and have the option of measurement to ticking one of five possible responses.*

Please rate the importance on the following skills and attributes to be an elite level badminton player:

5 **Very Important**	**4** **Somewhat Important**	**3** **Neither Important nor Unimportant**	**2** **Somewhat Unimportant**	**1** **Very Unimportant**
49. Technical prowess	☐	☐	☐	☐ ☐
50. Speed	☐	☐	☐	☐ ☐
51. Aerobic Capacity	☐	☐	☐	☐ ☐
52. Power	☐	☐	☐	☐ ☐
53. Agility	☐	☐	☐	☐ ☐
54. Tactical awareness	☐	☐	☐	☐ ☐
55. Consistency	☐	☐	☐	☐ ☐
56. Height	☐	☐	☐	☐ ☐
57. Strength	☐	☐	☐	☐ ☐
58. Flexibility	☐	☐	☐	☐ ☐
59. Vision (eyesight)	☐	☐	☐	☐ ☐
60. Intelligence	☐	☐	☐	☐ ☐
61. Mental toughness	☐	☐	☐	☐ ☐
62. Core stability	☐	☐	☐	☐ ☐
63. Other please specify_____	☐	☐	☐	☐ ☐

- *Objective 15. To identify player's view on what is the accurate rate to identify those talent ability on young children. Response to this question enable to score, and have the option of measurement to ticking one of five possible responses.*

Please indicate how accurately you think the following skills and attributes can be identified at an early age:

5 **Very Important**	**4** **Somewhat Important**	**3** **Neither Important nor Unimportant**	**2** **Somewhat Unimportant**	**1** **Very Unimportant**
64. Technical prowess	☐	☐	☐	☐ ☐
65. Speed	☐	☐	☐	☐ ☐
66. Aerobic Capacity	☐	☐	☐	☐ ☐
67. Power	☐	☐	☐	☐ ☐
68. Agility	☐	☐	☐	☐ ☐
69. Tactical awareness	☐	☐	☐	☐ ☐
70. Consistency	☐	☐	☐	☐ ☐
71. Height	☐	☐	☐	☐ ☐
72. Strength	☐	☐	☐	☐ ☐
73. Flexibility	☐	☐	☐	☐ ☐
74. Vision (eyesight)	☐	☐	☐	☐ ☐
75. Intelligence	☐	☐	☐	☐ ☐
76. Mental toughness	☐	☐	☐	☐ ☐
77. Core stability	☐	☐	☐	☐ ☐
78. Other please specify_____	☐	☐	☐	☐ ☐

- *Objective 16. To identify player's view on which attribute heavily influenced on natural selection. Response to this question enable to score, and have the option of measurement to ticking one of five possible responses.*

Please indicate which of the following skills and attributes are more heavily influenced by natural selection (i.e. god given or genetic gifts):

	5 Very Important	**4 Somewhat Important**	**3 Neither Important nor Unimportant**	**2 Somewhat Unimportant**	**1 Very Unimportant**
79. Technical prowess	☐	☐	☐	☐	☐
80. Speed	☐	☐	☐	☐	☐
81. Aerobic Capacity	☐	☐	☐	☐	☐
82. Power	☐	☐	☐	☐	☐
83. Agility	☐	☐	☐	☐	☐
84. Tactical awareness	☐	☐	☐	☐	☐
85. Consistency	☐	☐	☐	☐	☐
86. Height	☐	☐	☐	☐	☐
87. Strength	☐	☐	☐	☐	☐
88. Flexibility	☐	☐	☐	☐	☐
89. Vision (eyesight)	☐	☐	☐	☐	☐
90. Intelligence	☐	☐	☐	☐	☐
91. Mental toughness	☐	☐	☐	☐	☐
92. Core stability	☐	☐	☐	☐	☐
93. Other please specify_____	☐	☐	☐	☐	☐

- *Objective 17. An open question to allowed researcher to collect any TID comments from players.*

94. Are there any other comments that you would like to make about talent identification and talent development?

_____

_____

_____

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE

Appendix V: Information letter and Consent form to Participate in interview

University of Stirling

Dear Sir

I am a researcher at the University of Stirling, where I am carrying out an investigation into "Talent Development Identification in China and UK". With your co-operation, this study will determine a number of key facts about high performance long term development in badminton. From the investigation it will be possible to find out what you as a participant value, and whether your needs are being net.

The interview may take an hour. There are no right or wrong answers. There are a number of questions for you to speak more about certain issues. Please try and answer the question if possible as truly as you can.

The completed interview will be treated with absolute confidentiality. Information identifying the respondent will not be disclosed under any circumstances.

Therefor you should not worry about how your answers. Other parties will not at any time have access to the full transcription. You have right to remain anonymous and keep the the interview transcription.

Thanks you in advance for your co-operation.

Kind regards

Rita.Yuan. Gao

Researcher

University of Stirling

Title of Project: A Comparison between Talent Identification Development for badminton in China and the UK

Name of Reserarchers: Rita Yuan Gao

Please initial box

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason. ☐
3. I am wiling for the erview to be recorded. ☐
4. I agredd to take part in the above study. ☐

Name of Participant _____ Date___/____/____ Signature_____

Researcher _____ Date___/____/____ Signature_____

_____

Appendix VI: Semi Structured Interview for Badminton Coaches

The following questionnaire seeks views and opinions around talent identification and talent development from experienced international badminton coaches. Your identity will be protected and all the information you provide will remain anonymous.

1. **Can you tell me your name and you current job role and for which country?**

2. **Please describe your badminton coaching experiences in terms of number of years, coaching qualifications and the performance level of you players?**
   This question intends to get a feel for the qualifications and experience of the coach.

3. **Do you think that great players are born with something special? Have they been born with advantages or is it solely down to hard work, commitment to training and competition and expert coaching, i.e. could anybody reach the top given the right opportunities?**

4. **When do you think people mean when they say "that badminton player has got talent?" What do you understand the word talent to mean?**

5. **What do you understand by talent identification?**
   I.e. looking for future elite badminton players
   - At what age do you start looking?
   - Where and how do you look for them? Is it through schools, clubs? Do you invite them or do you go to them?
   - What qualities and characteristics are you looking for?
   - Are some qualities more important than others? Do you prioritise anything in particular?
   - Which aspects/areas are people born with as opposed to which skills and qualities can be developed?
   - How often do you carry these assessments out? How often do you re-assess selected players?
   - What sort of testing do you put players through?
   - How can you tell that players do not display these because they have been exposed to a lot of badminton coaching already? I.e. how do you separate current performance level from potential performance level?

6. **Have you ever spotted a young player as future champion? If so how did you identify this person? What happened? Please tell me the journey you took with this player?**
   - Was it successful? Conversely have you identified players that you thought had potential but were wrong? What happens to these players how long do you persist with them?
   - At what point do you know you have a future champion on your hands? At what point do you start questioning/doubting whether this player will make it.
   Every coach will have different views about possible future champions. This question will explore how the coach identifies the top badminton players of the future. It is necessary to question and find out which elements are most important to look for at the beginning.

7. **In your experience do these talent identification models change from country to country or are the methods fairly widespread and universal?**

8. **Have you heard of the 10 year / 10,000 hour rule? What do you think about it?**
   Basically it is commonly believed that you need to undertake 10 years or 10,000 hours of deliberate practice to get to the top. What the coaches thoughts?

9. **When do you think players should start to specialise (i.e. the only sport they play) in badminton?**
   Find out coaches thought idea age for specialise in badminton.

10. **How gradually to you increase the frequency, duration and intensity of training?**
    - Are there any factors that influence when to make these increases? i.e. Is this increased according to ability, age, or is it the system and the structure or as the local opportunities present themselves.

11. **What are the most important ingredients in a badminton development programme?**
    They might respond with things like:
- Technical and tactical badminton coaching?
- Physical conditioning
- Facilities
- Training partners and sparring partners
- Mental skills and attitudinal traits (commitment, discipline, perseverance etc.

12. **Does it cost the player or parents money? If so are these costs significant (i.e. how much are some people effectively excluded because of costs). How do your players fund this quality and quantity of training and competition? Can players make it if they are not from wealthy backgrounds?**
- At what point does a player start receiving support for training and competitions?
- Trying to look at the state funded approach from China v the mixed economy approach by GB (private/personal funding as well as public)

13. **Are there any gaps in the system? If so what would you like to see introduced and why is it not in place already?**
- Trying to work out if people know about various things and it is a question of insufficient resources or is a greater emphasis / priority placed on one area over another. Does this differ between the two countries

14. **Do you worry about burnout? Dropout rates? Or is the priority to get them on the intense training should be? For example at what age the players should be train in how many hours per a day or week?**
- What happens to the players that drop out of regional/national squads or school sports programmes? Do they get picked up anywhere else or are they lost to the sport of badminton?
  (trying to work out how ruthless the system is)

15. **Does education fit with badminton training? If so how does it fit?**

Questions 14 and 15 are trying to establish coaching philosophy? Is it solely about producing future champions or is it about developing a player base and groups of performance players who will have a lifelong engagement in the sport and physical activity? We are trying to work out if this philosophy differs between cultures and countries.

Is there anything else you would like to tell me?
Would you like to remain anonymous?
Would you like a copy of the transcript?

THANK YOU FOR YOUR THOUGHTS AND YOUR TIME

Appendix VII: List of Interviewees

Name	**Job Title**	**Nation**	**Date of interview**
Liu Qi Wen	Coach for national team (age 16)	China	24. 04. 2014
Han Jing Na	Coach for national team	China	14. 04. 2014
Liu Lu	Coach for Shanghai province team	China	04. 06. 2014
Lao Bao Jiang	Coach for national junior team	China	20. 08. 2014
GB Coach A	Coach for National GB badminton	Britain	13. 03. 2014
GB Coach B	Coach for Scottish Junior National team	Britain	24. 04. 2014
Andy Bowman	Coach for Scottish National team	Britain	14. 03. 2014
Yvette Luo	Coach for Scottish National team	Britain	01. 02. 2015

Appendix VIII: Interview Transcripts

(Rita Yuan Gao in BOLD)

Semi Structured Interview for Coaches

Coach B. 14th. 04. 2014 interview at Stirling University

Can you tell me your name and you current job role and for which country?

My name is XXXX, currently I coach Scottish Junior National players and also players from in early development squads. In the past I coached the Scottish national senior squad for more than 15 years.

Please describe your badminton coaching experiences in terms of number of years, coaching qualifications and the performance level of you players?

I have been coaching badminton for about 25 years. I have coached players of all ability levels from beginners to international level. I hold the advanced coaching qualification.

Do you think that great players are born with something special? Have they been born with advantages or is it solely down to hard work**, commitment to training and competition and expert coaching, i.e. could anybody reach the top given the right opportunities?**

I think the greatest players were born with something special. But to be a great player he or she must still put in the hard work. I have worked with players who have talent, with something special but they didn't want to do the hard work. Also I see players who are willing to work hard but do not have talent. No matter how hard they work I believe there is a limit to their performance level. Clearly if you don't do the hard work you won't go anywhere. So the hard work is a must.

When do you think people mean when they say "that badminton player has got talent?" What do you understand the word talent to mean?

When someone says to me this person has got talent, it means the quality of the shots this person can play are of a very high caliber. It refers to a person's ability.

What do you understand by talent identification?

People try to come up with tests for youngsters, to direct them to the appropriate sport. Some sports it is about limb length, good height and correct body composition, these types of measures can help identify and signpost the youngster to the most appropriate sport for their body build. But talent ID in the badminton should just be about hand eye-coordination. If you have good hand eye coordination and a good attitude you may do quite well in badminton. If we have the access I think it is good to test the youngster to see how quick they can learn, how quick they can pick up thing, do they self analyse when they on the court. That would tell you if the kid got the chance. Some mental or sport psychology tests might be useful, but in badminton we don't have a lot of resources and these are often overlooked.

(Additional follow up question by email;)

Has your country been running talent identification? If so, can you tell me how is it being running and what do you look for? And how often do you have talent identification in your program?

They have been running talent identification days for several years now but it is still in its infancy and is not all that scientific in regards to badminton but they are learning all the time.

They simply look at "agility exercises" - "speed" - "hand-eye co-ordination" - "throwing technique"- "fast feet."

These are the main focuses of their day (it is only one day) and of course there is a lot of hit and miss about it but perhaps it is better than nothing at all?

I believe rather than Nationally these should be carried out locally so that the children do not need to travel to a central meeting point in the country. These exercises are carried out for the age range of 6-10 years.

This should be delivered locally in areas or regions of the country BUT NOT NATIONALLY!

Have you ever spotted a young player as future champion? If so how did you identify this person? What happened? Please tell me the journey you took with this player?

Yes, I have spotted few, for example, I selected a young girl because of her excellent attitude and desire to work hard, but she didn't have the talent. This player didn't have the natural deception and subtle skills required, for example the cut shot. She found it difficult

to learn new skills. She worked very hard and was very fit. Sometimes she needed to see successful things from her opponents to then bring into her own game. This player went as far as she could but she didn't have the talent so her level was limited.

In your experience do these talent identification models change from country to country or are the methods fairly widespread and universal?

Each country does different TID. For example, in China players get selected and then they are worked very hard and the best will come through otherwise they will be thrown out or deselected. In our country there isn't the same number of players, so the ones in the system need to be nurtured, there is much less de-selection as there are far less players to step in, so after a while if we don't want them, we are reluctant to throw them out of our system. Because we have a limited number of players, so we attempt to keep them in the sport.

Have you heard of the 10 year / 10,000 hour rule? What do you think about it?

I think 10, 000 hours rule with very good coaching and very demanding sessions would produce a champion but I don't believe it is just 10,000 hours. I think it could be shorter if someone is exceptional, but it is not so much an exact time period or number of hours, which are important it is the quality, I don't believe it's just 10.000 hours. It could be short if someone is very talented. The thing I think people are missing is not just 10,000 hours, but it must be 10,000 quality hours.

When do you think players should start to specialise (i.e. the only sport they play) in badminton?

I think I will have a different opinion than others. It is not really about when to specialise, this is determined by when you start badminton to some extent. In Scotland we should ask players at the age of 13 to specialise in one sport. In our country we don't get the best athletes into our sport. They will probably be playing something else. Also in today's society children have so many different opportunities competing for their time, there are iPads, computer games as well as other sports. I don't think if you asked someone to give up football at the age of 6 to play badminton they would do it. It is very difficult to ask someone to give up other activities to just concentrate on one sport.

How gradually to you increase the frequency, duration and intensity of training?

It depend on what you would consider a top performer, it depends on how they progress, how they develop, how they grow. I believe there are some mistakes being made in Scotland at this particular moment in time. Youngsters have too many sessions, don't have enough time to recover, refuel, sleep and as a result children don't have the time to grow. We need to let children grow. The decision to start to increase frequency, duration and intensity should be taken on an individual basis when the person is ready. This will vary from person to person.

What are the most important ingredients in a badminton development programme?

The most important part is the coaches, if they are not good the damage is down to all the kids they are in contact with. They must also make it fun for the players as well as educating them in all aspects of the game. We cannot all be champions but we can all enjoy playing the game if the development is carried out correctly.

Does it cost the player or parents money? If so are these costs significant (i.e. how much are some people effectively excluded because of costs). How do your players fund this quality and quantity of training and competition? Can players make it if they are not from wealthy backgrounds?

I think players can make it if they don't have a wealthy family. But if they have a wealthy background it can help. When they first start there is not much cost involved, but if they choice a performance route the costs will increase. But I believe there are a lot of funds and grants available for kids from poorer backgrounds which can help them become very good players. But they would never make a living from badminton until they reach the top international level.

Are there any gaps in the system? If so what would you like to see introduced and why is it not in place already?

Yes, I would like to grade players in this country. For instance, international player is level 1, county player level 2, club player level 3 or 4. If players win a few tournaments in a certain grade they move up. This would help get a lot more players playing competitions. At moment there is no such grading system in Scotland and England. But in France they have it and they have the biggest badminton participation in Europe.

Do you worry about burnout? Dropout rates? Or is the priority to get them on the intense training should be? For example at what age the players should be train in

how many hours per a day or week?

Yes, in our country we have massive dropout rate, because there is no safety net, if you pull the player from the performance pathway at the moment in this time at age 17 a lot them would down tools and stop playing badminton because they feel they are not wanted, but that is not the case they just won't receive anymore funding. If we had a grading system they would just play at a lower grade. If we had this structure and these players kept playing it would also help drive the performance standards up at that level.

Burn out, yes at moment we are getting players to do too much too young. Too many competitions and not enough training.

At age 10 if the player is keen and has chosen a performance pathway I would give them 2 hours a day for 4 days a week. At 12 -14 years old I would increase to 3-4 hours per day depending on the growth and the individual. If players are strong enough physically a 20-25 hour a week programme could start at age 15-16.

Does education fit with badminton training? If so how does it fit?

Yes. They can study. It does depend on what course they do. But they can extend their study programmes, study part-time, there is flexibility. But if you want to be the best in the world, at some point you have to go full-time and combining education and world level badminton becomes difficult. They can study two or three hours a day and then focus the rest of their time on badminton, but to be the best in the world there is a point when I don't think you can do it alongside education, although some Danish players have done it. I think study is good for player, to have another interest, a distraction from badminton to keep the mind occupied.

Is there anything else you would like to tell me?

In our country I would like to see centres all over the country - development centres. When the players old enough they can chose to move to the main centre. At moment we only have one national centre which is in Glasgow.

Do you want to remain anonymous?

If I see the finished article (transcript) I can then advise you but at the moment I would not want attributed to me.

Would you like a copy of the transcript?

Yes please.

Thanks very much for your time.