TOP Foundation

A Review of Literature:

The impact of competitive school sport on students' performance in the sports they play competitively and for developing future careers as elite athletes.

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1.0 INTRODUCTION

This literature review, produced by the TOP Foundation, is presented to Ofsted to provide an identification and synthesis of published evidence (both in the UK and internationally) on the impact of competitive school sport on students' performance in the sport and their potential to develop a future career as performance athlete.

Over 150 years ago academic institutions started to use competitive sport as a means to prepare young people, especially boys for the rigour of life (Sage et al, 1998). Since then its use has became more wide spread and today all schools provide some form of competitive sport as part of their school provision.

In the 1980's there was a move away from the direct 'competitive' nature of sport especially at primary level (Green et al, 2004) as it was felt too damaging to the less able children. In recent years this trend has reversed, as teachers and parents see the opportunity competitive sport can have in building resilience in young people as they encounter the emotions of winning and losing within a peer environment.

Over the last 20 years the presentation of competitive sport in schools has started to change from the rather traditional 'first XI' approach upon on which hangs the reputation of the school, to a gradual shift towards using competitive school sport as a means to encourage greater participation. The introduction of national strategies in England for physical education (PE) and school sport (PE, School Sport and Club Links (2002 - 2008) PE and Sport Strategy for Young People (2008 – 2011) and School Games (2011 to current) has helped to drive this shift and has resulted in the national governing bodies (NGBs) of sport developing their competition frameworks to meet the needs of young people. For the younger ages some NGBs have reduced the field size of play, simplified the rules, created mixed small sided formats with rolling substitutions and reduced time periods; allowing young people to experience a greater variety of roles within the game and to broaden their skill development.

Schools and agencies have also provided teacher support in 'alternative' formats of competitive sport to appeal to wider cohorts of students (i.e. Ultimate Frisbee and initiatives like yoUR Activity). The School Games programme at its foundation (level 1) has encouraged schools to activate an intramural or inter house approach to competitive sport.

There is recognition that many sports cannot be played without some form of competition and that the nature of competition has many faces; from winning at a Junior World Championship to a casual game using jumpers for goal posts. In the drive to embrace the widest cohort of young people into PE and school sport, the understanding of competition in its widest context includes the concept of 'taking on a challenge' and 'achieving your personal best'. This more developmental approach to competition is particularly attractive to schools who struggle to engage the least active pupils, especially girls who are reported to be turned off by aggression in traditional competition (Gorely et al, 2011). Some sports lend themselves particularly well to a focus on personal best, none more so than cross country and track and field, where measurement, goal setting and improvement can be rewarding, whatever the ability of the young person. The identification of personal best and goals settings are used extensively with performance sport and to a wider extent within the work place.

The majority of published papers clearly demonstrate that young people who engage in competitive school sport improve their ability in that sport. However, there are limits to these improvements at both ends. Too little practice and the ability to achieve is severely restricted, yet too much and the negative impacts on a young person can be profound; an increased risk of injury (Gould et al, 2010; Baker et al, 2009), reduced enjoyment and motivation (Creswell et al, 2005; Vallerand et al, 1986).

At the highest level of competitive school sport, the latest thinking and retrospective research on our best performance athletes in UK has seen a significant rethink about the best environment to nurture young athletes in. Despite this growth in understanding of talent development, some sports and struggling to make full use of this knowledge on the ground.

2.0 METHOD

The relevant papers and reports were collated using a range of sources including peer reviewed journal articles and sources from the education and sporting sectors. As the breadth of literature in talent development and excellence in sport is so wide, this review of literature centred on a select number of high quality reviews and milestone papers.

The peer reviewed journal articles were located and accessed using Primo Central (resource index). Key search terms included “success in school sport”, “success in competitive school sport”, “talent development in school sport”, “talent development at elite level” and “specialisation in school sport”. The search was conducted on the first 200 articles filtered by relevance. Approximately 5,000 journal articles were located, of which 15 reviews selected as relevant to examine for this research. The review articles have been summarised in appendix 1.

Further searches through other sources were carried out to locate primary research articles within the literature. In addition UK Sport assisted the review team with access to research that is used to inform the UK world class system.

3.0 DISCUSSION

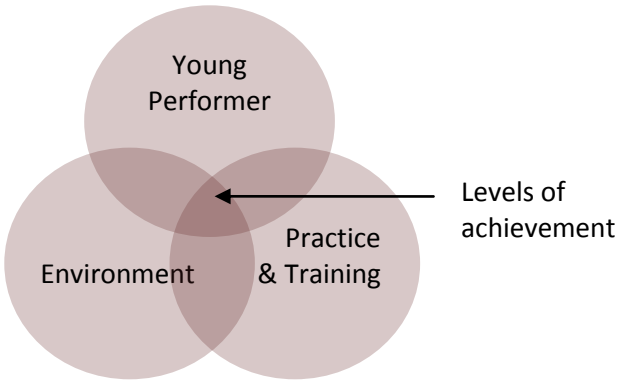
This section asks questions about the impact competitive school sport has on a sporting success and explores the environment in which our most talented young athletes are being nurtured in.

3.0.1 Factors that underpin achievement in sport

The following text looks at the elements that underpin success in sport, with particular reference to the competitive school sport environment and young performers' experiences.

Research shows us that the factors that influence achievement in sport can be divided into three areas: i) the young performer, ii) the environment and iii) the practice and training (Rees et al, 2013).

Figure 1: Factors affecting level of achievement (adapted from Rees et al., 2013)



3.1 The young performer

Each young person is different and brings a unique set of factors into the mix, some relating to their genetic makeup and others to their personality. It is clear that there is a long way to go in our meaningful understanding of genetic influences and in our understanding of the influence of nurture on these genetic factors.

3.1.1 Birth date

It is thought that the time of year a young person it born can have a positive and negative effect on their chances of success; it is termed relative age group effect. For young people born at the start of an age range (typically September) they have a potential growth and maturation advantage compared to those born at the end of the age range (typically August). In sport where maturation and enhanced physical characteristics are an advantage, there is thought to be a greater chance of selection into school and representative teams. This potentially leads to a cycle of better coaching, support and motivation which leads to more training and subsequent improvement.

Younger less mature individuals have been shown to suffer from self-restriction, physical inferiority and systemic discrimination due to older more physically mature players being picked for teams (Delorme et al, 2010). The role of the coach can be shown to facilitate the relative age group effect,

where coaches favour more developed older athletes (Helsen et al, 2005), although more targeted research into this area is required.

Below is a diagram taken from a review by the Institute of Youth Sport (Mugglestone et al., 2010) highlighting a hypothetical example of the differences between two boys in the same academic year who are separated by 11 months in age.

Figure 2: Relative Age – A hypothetical example of the possible effect of relative age. (From Mugglestone et al., 2010)

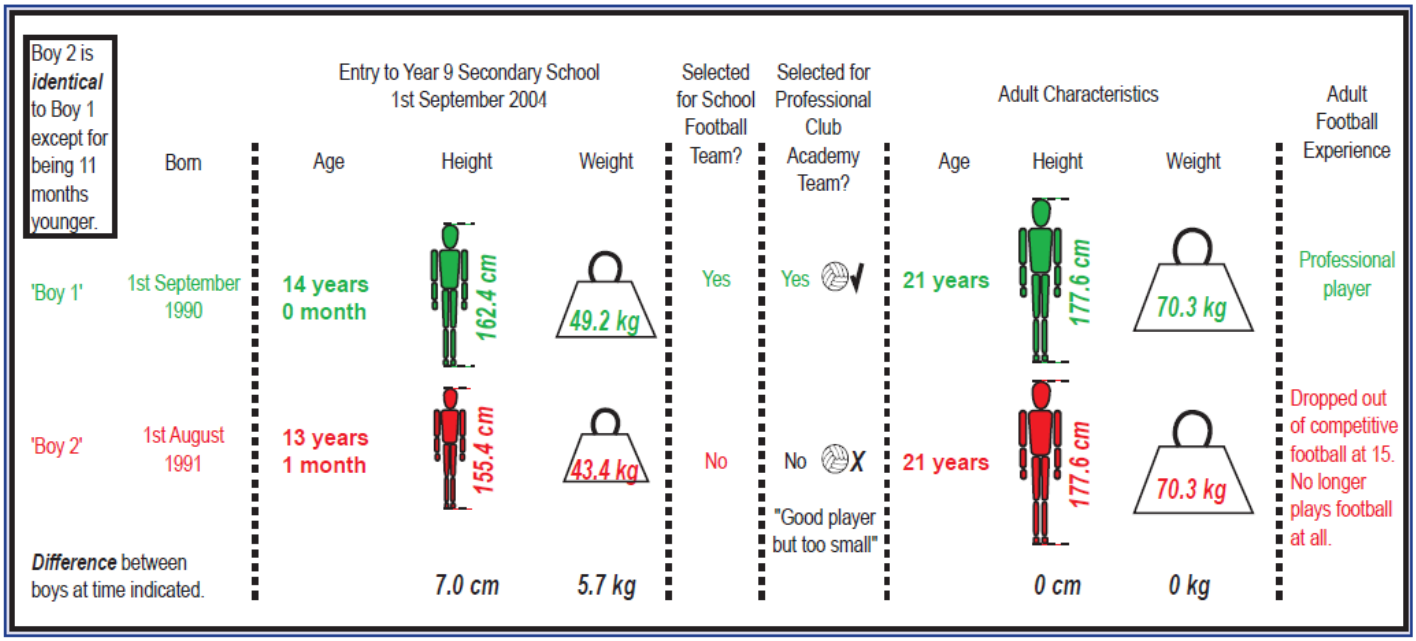


Figure 25. Relative Age - A hypothetical example of the possible effect of relative age: Let us consider the effects of relative age in a simple theoretical way. In order to emphasise the potential impact of even 11 months worth of growth let us consider an 'average' boy born on the 1st September 1990 ('Boy 1'), and an identical boy born 11 months later ('Boy 2'). [Let us also recognise that there is no such thing as an average boy. However, we can measure the height and weight of large numbers of children (thousands) and from this calculate growth curves, which give a reasonable indication of the pattern of height or weight change that could be expected in a child or young person at a certain age]. From the figure below we can see that the 11 months difference in chronological age results in substantial differences in height and weight on the 1st September 2004. However, when the boys reach adulthood there will be no differences in height and weight because they are identical. However, if their physical characteristics in year 9 influenced selection to a team (as is suggested in our theoretical example described graphically in the figure below) it is possible that Boy 2 would be deprived of chances given to Boy 1 simply because he was born in August rather than 11 months earlier in September.

A number of studies including the review by Musch et al., (2001) have shown that there is evidence of relative age group effect (Cobley etal., 2009, Baker & Logon, 2007, Figueiredo et al., 2009, Schorer et al., 2009). These studies were done primarily on team sports, including ice hockey, football, baseball, basketball, volleyball, and handball.
More extensive research into relative age group effect is indicating that it is not evident across a wider range of sports (Albuquerque et al., 2012, Baker et al., 2009, MacDonald et al., 2009). A study of ice hockey players (Gibbs et al., 2011) showed that at the very top (Olympic level) there was a reversal of the effect.

Interestingly the impact of relative age group effect in female athletes has shown to be less pronounced (Vincent et al, 2006).

In summary, the research suggests that in some sports there is evidence of relative age group effect favouring young performers with birthdays at the beginning of an age range. But, it is not

consistently apparent across all sports and has been found less apparent in adult high performance teams. Coaches and PE teachers should be aware of the impact they have in facilitating relative age group effect. The school and coach encouragement of 2nd and 3rd team players could be an advantage in countering this effect.

3.1.2 Genetics and physical parameters

The effect of genetics on achievement in sport is undisputed; the questions under debate are what aspects of our genetic profile contribute to success and to what level of influence it has in different sports (Eynon et al., 2011, Rees et al., 2013).

In the review by Rees et al., (2013) his team summaries that there is a wide range of evidence to suggest there are inherited components in the prowess of agility, speed, endurance, muscle strength, fatigue resistance, trainability and reaction time. His team go on to indicate this might also include inherited personality, character traits and susceptibility to injury.

Teachers and coaches often use anthropometrical factors to select school teams, selecting taller young people for sports like netball and rowing and smaller ones for gymnastics and diving. A substantial amount of research identifying the specific anthropometrical and physiological traits across a large range of sports exist at all levels such as football (Mirkov et al, 2010), rugby (Higham et al, 2012), rowing (Schranz et al, 2012) and endurance runners (Lorenz et al, 2013).

However, limitations in variability in growth ensure that the nature of anthropometric profiling is unstable (Till et al, 2011). Early maturing students are often taller, heavier, faster and more powerful than their peers who may be late to mature. Consequently biological maturation has a detrimental influence on the accuracy of talent identification using anthropometric profiling in school aged performers (Meylan et al, 2010).

Physiological traits such as anaerobic and aerobic capacity, strength, jumping and sprinting ability and body composition have been categorised as crucial for elite performance (Reilly and Secher, 1990), yet in childhood these traits are also heavily affected by maturation, making any form of reliable testing of physiological traits as unreliable too.

Sports or schools that select their young people through physiological traits such anaerobic and aerobic capacity, strength, jumping and sprinting ability and body composition would be wise to understand the implications of biological maturation in young athletes. While these traits have been categorised as crucial for elite performance by Reilly and Secher (1990), they are notoriously poor at identifying future success. In an unpublished review by the Institute of Youth Sport (Mugglestone et al., 2010) only the vertical jump test was found to be reliable in school children as a predictor of future success in football.

In summary, the genetic traits young people inherit from their parents are important factors in their success in school sport and in their chances of becoming world class athletes. The impact of early and late maturation can be both positive (late maturation can be an advantage in diving) and negative (late maturation can be a disadvantage in rugby). Schools and coaches need to develop a

flexible approach to their selection of their teams and sports scholars. Research indicates that using anthropometric and physiological profiling in adolescence is a poor predictor of future success.

3.1.3 Psychological factors

In the review by Rees et al. (2013), he identified 21 studies which showed that more successful performers displayed: higher levels of general motivation; confidence; perceived control; mental toughness; resilience; ability to cope with adversity; resistance to choking under pressure and a better command of mental skills like goal setting; anxiety control; imagery and decision making. What is not clear from the studies is if these traits and mental skills are learnt during the early part of the athletes' careers, perhaps when they are at school.

Addressing this Gould et al., (2010) states talent development has been shown to be a long term process where a structured support system is crucial for the development of a talented athlete. Specifically, a mature personality and self discipline is crucial for the development in addition to physical talent (Gould et al, 2010). It is commonly known that some of these psychological skills are mastered during adolescent years where schooling has a fundamental effect upon these factors. Teachers in addition to peers have been shown to be crucial to the support needed of developing talented individuals. Interesting teachers were also cited as important in helping students to develop their personal identity away from sport (Gould et al, 2010).

There are very little high quality studies on the negative impact of competitive school sport on the psychological health of exceptionally gifted young athletes. But young athletes, parents and teachers cope daily with the pressures of missing lessons and home study time, negative reaction to pre competition anxiety, large amounts of time travelling to training and a lack of down time with non-sporting peers.

In summary, the ability of the young person to learn and adapt with the psychological demands of performing in competitive school sport is an important element of success. There are observations that highly successful athletes may have a tendency to be obsessive about their sport and at school may struggle to fit into 'normal' school life (Rees et al., 2013). The pressure on young people to conform and be accepted within their peer group is a hard step for talented young athletes where their sporting demands mean they spend considerable time away from their school peers.

3.2 Environment

In this section the review discusses the impact of the environment on the sporting chances of young people involved in competitive sport.

3.2.1 Birthplace

Retrospective studies of high performing athletes in the US and Canada (Cote et al, 2006) and the UK (Baker et al, 2009) suggest that athletes from small communities (30,000-100,000 people) have a greater chance of succeeding in sport. This birth place effect might indicate the importance of the early years on a child's engagement with PE and sport. Rees et al., (2013) suggests in small to medium communities young people may have better access to sport facilities, a more fertile ground for play, participation and competitive experience and have an increased likelihood of competition with or against adults. Rees's hypothesis is that skill rather than early maturation is the key factor in this less crowded sporting pathway, suggesting the less crowed pathway is more favourable for creating adult champions.

Smaller cities have been shown to have more emphasis on the quality and quantity of play where there is greater access to facilities and open spaces, as well as an emphasis on engagement with families, schools and communities. This can lead to increased developmental support for the athlete (Cote et al, 2006; MacDonald et al, 2009). Communities that are too small suffer from not having the facilities, support networks or coaching available to the athletes to lead the developmental process of talent to elite level. In support, large urbanised environments are thought to limit the opportunities available to young people; this is shown by lack of facilities available for outside play due to a close proximity to street traffic, resulting in smaller social networks for children and diminished opportunities to grow social and motor skills (MacDonald et al, 2009).

Studies on male and female athletes have shown that they receive different treatment in sport socialisation; however research into the birth place effect for both genders have shown to be favourable to smaller cities and towns (MacDonald et al, 2009; Baker et al, 2007).

In summary, the research is showing that certain sizes of communities have positive effect on the early years of a developing athlete, but at this stage only speculative answers are being provided as to why.

3.2.2 Socioeconomic status

A family's socioeconomic status is considered to be an influential factor in the general participation of children in sport (Kirk et al, 2005). It is unknown if this is related to the financial cost associated in taking part in sport or if it is related to the cultural 'value' placed on sport.

Rees et al., (2013) states that there is minimal evidence to link socioeconomic status and success in performance sport.

Past literature such as Hoolihan et al (2000) has shown a tendency to suggest that independent schools have better coaching and support than the state sector. Hoolihan et al. (2000) states there is a strong link between the advantages of the independent sector, social class, educational attainment and sports participation.

Tozer (2013) in his analysis of the school backgrounds of the members of the British Olympic team between 2000-2012, claimed that the members who went to independent schools out performed non independent school members of TeamGB. Tozer did not put this success down to outstanding sports facilities and specialist coaches at the private schools. He was also unable to find a link with sport scholarships, but explained that most scholarships are awarded at 11-13 years as parental pressure prevents schools from offering them at 16 years when it is much easier to recognise talent. While Tozer states that members of TeamGB attending independent schools reflects the national average for the school population post 16, he states that those attending independent schools who were placed in the top eight finishers within TeamGB, is higher than the national average. Some further consideration is needed to normalise for the bias of TeamGB's success in sports, like rowing, equestrian and sailing, on the data. If TeamGB's success came predominantly from sports like football, table tennis, boxing, basketball and taekwondo, the findings are highly likely to be reversed.

In summary, it is hard to establish from the evidence if the socioeconomic status has a direct link on achievement in high performance sport. Is it is clear from the research that socioeconomic status does impact general participation in sport and by association it would be possible to say that by default it does affect participation in competitive school sport. When participation is linked to access to practice (see next section) it is possible to suggest that socioeconomic status does effect achievement, but to do so with confidence would be misguided. This is an area that needs further research.

3.2.3 Support

Quality of support from parents, family, siblings, coaches and teachers is all important in the development of a young athlete as they journey towards elite performance (Connaughton et al, 2010). Childhood support is extremely influential throughout adolescence; literature shows that for junior elite athletes, parents and coaches provide different types of support where parents provide the most significant role of emotional and tangible support throughout development to elite performance (Wolfenden et al, 2005; Cote et al, 1999).

The support of the coach has continually been stated as essential for the transition and support to elite performance (Durand-Bush, 2002; Gould et al, 2010). Coaches who installed confidence and trust have been shown to produce successful teams and athletes (Durand-Bush, 2002). Teachers and friends have been shown to be the two main influences for young athletes (Gould et al, 2010).

Gould et al (2010) in his review of UK Olympic champions highlighted the importance of breadth of support around successful athletes. Suggesting that the range of support an elite athlete requires needs be individualised and broad. While researchers agree that support is critical success, Rees et al. (2013) indicated that poorly delivered support may be worse than no support at all.

There are a number of key transition phases for young athletes at school; perhaps the two most common ones are between primary secondary schooling and at the end of secondary schooling. While many PE teachers and school coaches try hard to prepare their young athletes for the latter and few young athletes realise the consequences of a widening selection pool post 18 years will have on their ambition to continue to succeed in sport.

Figure 3: A hypothetical example looking at the diminishing chance of selection as the size of the selection pool widens

U18 representative squads	U23 representative squads	Senior representative squads
Typical selection pool 2 -3 years – ie aged 16-18 years	Typical selection pool 4-5 years – ie aged 19-23 years	Typical selection pool 10-12 years – ie aged 19-32 years. In some sports like rowing and sailing this is longer.
If a young person is good enough to make England Squad in their sport as a junior.	They will go onto have at best a c50% chance of making a U23 squad – a later influx of talent post U18 will reduce this.	They will go onto have c20% chance of making the senior squad.

The transition of entering a more highly competitive environment occurs exactly at the time the young performers are leaving the nurturing support of their school. Schools that are interested in the future sporting achievement of their young athletes post school should look to prepare the young athlete for this critical transition phase.

In summary, the pastoral support surrounding a young person is critical to their talent development, achievement in life and future engagement in competitive sport. The balance of this support is unique to each young person and will vary as they transition along their pathway through school, life and sport.

3.2.4 Critical events

There is a growing suggestion that critical events or milestones during a performance athlete's early career helps in building resilience and perseverance (Connaughton et al, 2008). Positive critical events have said to be competitive success, beating key opponents and selection for squads whereas negative critical events have been shown to be parental divorce, negative peer influence, competition or selection failure, injury and family illness (Connaughton et al, 2010).

Performance athletes have reflected that these events act as catalysts in their personal growth and in learning to take responsibility for their own ambition (Connaughton et al, 2010).

While schools and coaches may not be able to design these critical events into competition cycles, their ability to recognise that they exist is desirable. There is a need for those around a young person to understand that setbacks and failure can be as important as success milestones, in building the long term perseverance and resilience of their young athletes.

3.2.5 Talent development programmes and early success

There is growing evidence that early success in sport is not a predictor of future world class success (Vaeyens et al, 2009). In addition, specialisation at a younger age may in fact limit the athlete in terms of motor skills and personal development and hinder their performance at senior level (Mostagavifa et al, 2013; Gould et al, 2010). A study of by Emrich et al., (2009) showed that there was no correlation between attending one of the German 'elite sports schools' and winning medals

at the 2004 Summer and 2006 Winter Olympics. It is worth noting that early development sports (like gymnastics) have not been included in the majority of studies.

Vaeyens et al, (2009) reports that data from the UK Sport Talent Transfer programme showed that athletes aged 16 to 25 years transferring from other sports can 'catch-up' with their peers within a year. These findings challenge the notion that early specialisation into a single sport is a vital step in achievement, and suggests that a range of high quality experiences in a number of competitive sports is certainly not a disadvantage. For young athletes who are 'cut' from the talent pathways as it narrows, an ability to 'transfer' into another sport is an advantage.

3.3 Practice and training

This section explores the role of practice (deliberate practice as described by Ericsson et al., 1993) and training (improvement of physiological fitness) on young people's chances of achieving successes in competitive school sport and as high performance athletes.

3.3.1 Phases of development

The pathway of a young athlete is important. Rees et al. (2013) in his recent review for UK Sport identified 3 phases: i) sampling, ii) specialising and iii) investing.

Research looking at primary age children suggests that there is also a foundation phase that builds the fundamental movement skills, including agility, balance and coordination (Gallahue and Ozum, 2006, Jess et al., 2006) and a functional understanding of movement concepts (Graham et al., 2007). These in turn lead to the underpinning or movement vocabulary of sports. It was Seefelt (1979) who explained that without these basic skills a young child would have a proficiency barrier to engaging in physical activity. In 1995 Seefelt went on to suggest that without these movement skills children would not be considered 'ready' for engagement in competitive sport.

Figure 4: Phases that successful performance athletes pass through in their development (adapted from Rees et al., (2013) and YST (2013))

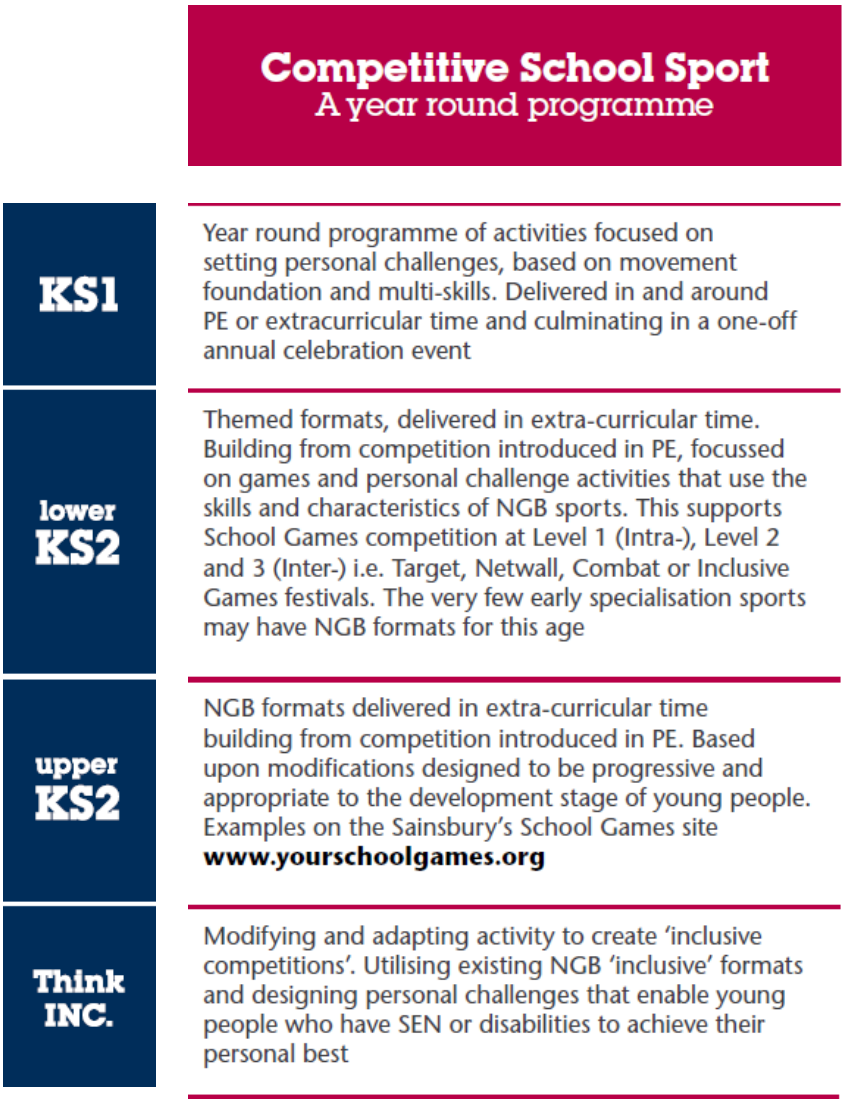
Phase 0	**Foundation**	Developing physical literacy, play and engaging in simplified multi sport activities
Phase 1	**Sampling**	Engaging in a variety of sport and deliberate play
Phase 2	**Specialising**	Specialising in one main sport
Phase 3	**Investing**	High investment of time and other resources in deliberate practice, training, and competitions in one main sport

Rees et al. (2013) states that there is no argument against the accepted premise that large volumes of deliberate practice is important in developing expertise and that in sports with a large global participant base it is a pre-requisite to achievement on the world stage . Interestingly he also highlights that

> *'…experiencing large amounts of practice in a diverse, unstructured (deliberate play) context during the sampling years may also be an important (especially in ball sports).'*

Drawing on the latest thinking, the Youth Sport Trust (2013) working in conjunction with 24 NGBs published a Physical Literacy framework for primary schools which included references to appropriate competition in this foundation phase.

Figure 5: recent competition programme advice to primary schools (taken from YST 2013)



In summary, the evidence and latest thinking shows that there are clear phases of development for athletes during their developmental years. While the experts say play, deliberate play and deliberate practice are important to success in sport, the question remains at what age or stage should these phases be implemented? There is no conclusive evidence to suggest when the right time is. For some sports like gymnastics and swimming this will be earlier and for some, like rowing, this will be later. Retrospective studies of high achieving performance athletes suggest for the highest achieving; these stages were experienced later in life than for the less successful performance athletes (Vaeyens et al., 2009).

Schools should be mindful of these findings if their school sports programmes require their young athletes to select a single main sport too early in their careers and if the volume of deliberate practice restricts the breadth and creativity of their skill development.

3.3.2 Deliberate practice

There is considerable debate on the amount of deliberate practice needed to achieve in sport and recent thinking is moving away from the 10,000 hours or 10-year-rule developed by Simon and Chase (1973), Bloom (1985), Ericsson et al. (1985) and then popularised by Gladwell (2009) and Coyle (2009).

Research is showing that there is a high degree of variability between the amount of deliberate practice undertaken between sports and between individuals (Vaeyens et al 2008, Gould et al, 2010; Baker et al, 2003). Rees et al. (2013) suggest that some young athletes have undertaken considerable periods of deliberate practice in their non destination sport, and quotes an example of a bob skeleton athlete who took up the sport and was Olympic standard in just 14 months who had had extensive experience in sprint/power training (Bullock et al., 2009).

In summary, when looking at the optimum volume and quality of deliberate practice schools offer their competing teams, they should take into account the wider opportunities their students have both in and out of school. Brlinsky et al, (2010) highlights how important the quality and context of deliberate practice is to success and suggests large volumes of low quality training may be wasteful.

3.3.3 Early specialization versus sampling

Parents of gifted young athletes are sometimes under pressure from coaches to ‘choose’ a single sport at an early age, while this might be appropriate in some sports, research is showing that early specialisation does have some risks associated with future achievement and long levity in sport.

Jayanthi et al. (2013) described sport specialisation as intense, year round training and development in a single sport with the exclusion of other sports.

Recent research has discredited this theory evidencing that elite performers are not always developed from specialising early in their sport (Vaeyens et al, 2009; Gould et al, 2010; Baker et al, 2003). Evidence shows that international athletes and their success on the world class stage was not necessarily preceded by top performances at junior level. The literature is also suggesting that early recruited children into talent programmes rarely becoming successful senior athletes (Vaeyens et al, 2009). Negative social, physical and psychological development have been linked to intense specialisation at an early age. Early specialisation often misses the late maturing athletes and has been found to increase the risk of injury and dropout from sport altogether. Results have consistently shown that early ‘specialisers’ spend fewer years at elite level than their fellow teammates (Gould et al, 2010).

More so, research supports later specialisation and early diversification in developing elite sports performance at senior level. Early diversification supports sampling to enable improvements in crucial skills and diverse experiences in an attempt to protect the health of athletes later on in life. In addition it provides young athletes with the crucial physical, cognitive and psychological environment to promote motivation in sport; in addition it also promotes the ability to transfer patterns of movement between sports and enhances motor skills that can be utilised during later specialisation (Jayanthi et al, 2013).

However, research shows that sports can be categorised into early and late specialisation categories (Balyi et al, 2004). Early sports such as gymnastics, diving, figure skating and table tennis require early specialisation, while sports such as racquet sports, track and field, combat sports, cycling and rowing require a later specialisation.

In summary schools should ensure their coaches understand the latest thinking in talent development and consider the negative impact of early specialisation on their young athletes in certain sports. Best practice competitive school sport programmes might consider offering a range of complementary alternative sport experiences to supplement their primary competitive portfolio.

3.3.4 Cultural traditions

The range of sports offered within school can vary considerably between countries leading to some students developing specific skills in sports that others have not had the opportunity to participate in. Specifically, history, environment, facilities and ease of sports participation are known to have an influence on the degree of sporting success (Baker et al, 2003).

In England, team sports (netball, football, hockey and rugby) make up a significant amount of competitive school sport, yet England's success on the world stage is not limited to these sports; suggesting only a tentative link between school participation numbers and international success.

Some schools only offer a narrow selection of competitive sports; these are often limited to main schools sports. This approach can provide the school with a number of advantages, reduced equipment, facilities and coaching costs, but it can also limit the achievement of those young athletes whose body type and natural ability are not suited to the chosen sports. Larger young people with poor hand eye coordination are particularly under supported in the traditional line up of competitive schools sports. Those schools that offer sports like cycling, rowing and canoeing can be seen to be providing real alternatives, especially for those young people who struggle with the disadvantage of being overweight.

Community based sports clubs and school aged club competitions play an important role in nurturing achievement in sport. Some sports have parallel talent pathways that are outside of the school team's competition structures like gymnastics (clubs) and football (academies), while sports like cycling and canoeing operate without a schools competition structure altogether.

3.4 Other factors

Education forms the basis to many sports and serves as the foundation to elite sporting success (Kirk et al, 2000). School sport experience and school sport background has been shown to be the strongest predictor of competitive involvement in sport for females and males respectively (Curtis et al, 1999); supporting the view that school sport is influential on elite sports performance.

It has been shown that extracurricular sports and PE increase self esteem and attachment to school that contributes important factors in the process of academic achievement (Trudeau et al, 2008).

Furthermore, elite athletes experienced increased educational success than non-athletes (Trudeau et al, 2008, Jonker et al, 2009).The increased educational success may be related to superior self-

regulation skills, based on studies that show talented athletes tend to perform above average in sports as well as in academic settings. This suggests the theory that possible elite performers have to have capable innate cognitive ability as well as elite talent (Jonker et al, 2009).

4.0 Conclusion

While there is a significant amount of literature on the development of talent and schools sport, there is very little consensus on the exact pathway and activity that will lead to optimal achievement in competitive sport. Perhaps this lack of specificity demonstrates what we as teachers and coaches already know – young people are all unique and the sports we play are all different.

"Everyone has a different genotype. Therefore, for optimal development, everyone should have a different environment. "

Dr J.M. Tanner (1989) Fetus into Man

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Appendix 1: Background information summary table

The following table summarises the most relevant academic reviews linked to competitive school sport, sporting excellence and talent development.

	Author(s)	Year	Theme	Summary
1.	Baker,J., Cobley,S., Fraser-Thomas,J.	2009	View of early specialisation	**What do we know about early sport specialisation? Not much!** Early specialisation occurs when children limit participation to a single sport on a year round basis, with deliberate focus on training and development in that sport. There is said to be a very strong positive relationship between the time spent practicing and the level of achievement, supporting the premise of early specialisation. However there are a number of negative consequences relating to early specialisation that should be considered including; negative physical, psychological and social development. More research has surrounded the impact of diverse activities and has focused on the development of elite performance through play activities. This supports the notion that a wide range of transferable skills may be more preferable and ensure advantages to the athlete when specialisation in their sport is taken up at a later date. The costs and benefits of early specialisation are still not clear. Baker,J., Schorer,J., Cobley,S., Schimmer,G., Wattie,N. (2009). Circumstantial development and athletic excellence: The role of date of birth and birthplace. *European Journal of Sport Science*. 9(6). 329-339
2.	Jayanthi,N., Pinkham.C., Dugas.L., Patrick,B., Labella,C.	2013	Sport specialisation and diversification in young athletes	**Sports Specialisation in Young Athletes** It has been demonstrated that research has not continuously demonstrated early intense training is essential for attaining an elite level in all sports, although data from studies is limited and has only really focused on small sample sizes. More so, elite athletes initiated intense training later in adolescences and were more likely to compete at a later age. Research suggests that emphasis should be placed on early diversification which increases the ability for transfer of patterns between sports and can avoid the negative effects related to early specialisation; of an increase risk of injury and psychological stress which can lead to dropping

	Author(s)	Year	Theme	Summary
				out of sports altogether. Jayanthi,N., Pinkham,C., Dugas,L., Patrick,B., LaBella,C. (2013), Sports Specialization in Young Athletes : Evidence-Based Recommendations. *Sports Health: A Multidisciplinary Approach*. 5(3). 252-257.
3.	Vaeyens,R., Gullich,A., Warr,C., Philippaerts,R.	2009	Multidimensional consequences of early talent identification	**Talent identification and promotion programmes of Olympic athletes** There are economic motives for early specialisation at a very early age starting for 6 years or younger but mostly between 8 and 12 years. This relies on the information that early success, early training onset and early participation will stimulate the development process supporting the dynamic that the level of attainment is directly related to the amount of practice, continually supporting the "10 years rule". However, International athletes have shown training began for them after the traditional timing (8-12 years), equally successful development into world class was not necessarily preceded by top performances at junior level, a review of Australian athletes showed that sporting excellence was achieved below the 10 year rule and that early recruited children never became successful athletes, alternatively many successful senior athletes were never supported in institutional programs at a young age. Vaeyens,R., Gullich,A., Warr,C.R., Phillippaerts,R. (2009). Talent Identification and promotion programmes of Olympic athletes. *Journal of Sports Sciences*. 27(13). 1367-1380.
4.	Bailey,R., Morley,D.	2006	Development in Physical Education	**Towards a model of talent development in physical education** Talent development in physical education should be mindful that the model should be multi-dimensional, differentiate from potential and performance, should acknowledge a range of factors that impact on ability and should focus on physical education. As research suggests there is not a clear identification that children identified with high ability evolve into high performing adults. Two stage processes for the recognisation of talent and initiation of support by teachers should be implemented. However, it is widely known that talent

	Author(s)	Year	Theme	Summary
				identification and provision in the areas of education and sport but not physical education are apparent. Schools have adopted a gifted and talented scheme but is targeted towards the needs of the group and not individualised. Within school, the elements necessary for basic provision is limited and therefore development programs in schools struggle. Bailey,R., Collins,D., Ford,P., MacNamara,A., Toms,M., Pearce,G. (2010). Participant Development in Sport: An Academic Review. *Sports Coach UK*. 4. 1-134.
5.	Cote,J., Lidor,R., Hackfort,D	2009	Specialise or sample	**ISSP Position Stand: to sample or to specialise? Seven postulates about youth sport activities that lead to continued participation and elite performance (International Society of Sustainability Professionals)** Many sports now require children to specialise in sports from an early age and are discouraged from diversified activities and generally this does not provide an optimal environment for lifelong involvement in sport or future success as an athlete. Early sampling suggested through the seven postulates highlight the benefit for continued participation and performance, this is based on the premise that early sampling will provide benefits later on in life such as fundamental movement skills and more mature cognitive and emotional skills. Cote,J., Lidor,R., Hackfort,D. (2009). ISSP Position Stand: To sample or to specialize? Seven postulates about youth sport activities that lead to continued participation and elite performance. *International Journal of Sport and Exercise Psychology*. 7(1). 7-17.

	Author(s)	Year	Theme	Summary
6.	Goncalves,C.E.B., Rama,L.M.L., Fgiueiredo,A.B.	2012	Talent Identification is a long process	**Talent Identification and Specialisation in Sport: An overview of some unanswered questions** Many problems exist with early specialisation and accurate observation of potential athletes. Growth and maturation of young players selected for talent development teams can lead to players being missed who are slow to mature which can lead on to missing development and opportunities to progress with high performance teams being saturated with early mature players. In addition, another problem exists in relation to biological markers for young athletes. Research has shown that biological capabilities can be improved with regular training, and specifically some crucial metabolic enzymes can be improved in younger athletes and not in adolescent athletes suggesting that it's may be that athletes need to be involved with certain activities to increase these metabolic capabilities to support performance at an elite level later on in adolescence. Goncalves,C.E.B., Rama,L.M.L., Figueiredo,A.B. (2012). Talent identification and specialisation in sport: an overview of some unanswered questions. *International Journal of Sports Physiology and Performance*. 7. 390-393.

	Author(s)	Year	Theme	Summary
7.	Martindale,R.J., Collins,D., Daubney,J	2005	Talent development programmes	**Talent Development: A guide for practice and research within sport** Factors linked to the effectiveness of talent development are complicated and extensive. Top performance at national level was not necessarily accompanied with top performance at junior level for a large proportion of athletes. Moreover, the development of skill, learning, attitude and relationships may be apparent more so than performance level. Consequently, it is a clear that a long term developmental plan is crucial for the long term focus to be an expert. Unfortunately, many programs still use early selection based on performance level within age group to select talented individuals. An approach that has been consistently shown to be problematic and instable. A separation of performance and potential is much needed in the development and identification of talented players. Martindale,R.J., Collins,D., Daubney,J. (2005). Talent development: A guide for practice and research within sport. *Quest*. 57(4). 353-375.

	Author(s)	Year	Theme	Summary
8.	Vaeyens,R., Lenoir,M., Williams,M.A., Philippaerts,R.M	2008	Talent identification and development	**Talent identification and development programs in sport: Current Models and Future Direction** Currently, there is no uniform framework in relation to how talent is defined or identified, and has seen to be increasingly problematic. It cannot be said that talented young performers will still be talented elite performer's, nor can it be said that under performing younger athletes may not develop into elite performers, the whole process includes many factors and makes the process of talent identification a process including lots of instability. Crucially, talent identification has taken a view that talented young performers if developed and supported at any early age can follow on to elite performance, however children who are late maturing can suffer and be disadvantaged by this system, missing out on practice opportunities early maturing children can be involved with due to their talents at a young age. Consequently, there is a demand for talent identification and development to mirror the inter-individual differences of performance to athletes selected, and consider the increasing unpredictability when selecting athletes at such a young age. Future recommendations should include a long term athlete development (LTAD) where long term aims consider the different stages of the developmental process and therefore expand the developmental opportunities to a larger pool of youngsters. Vaeyens,R., Lenoir,M., Williams,M.A., Phiulippaerts,R.M. (2008). Talent Identification and Development Programmes in Sport. *Sports Medicine*. 38(9). 703-714.
9.	Ackerman,P.L.	In Press	Against the theory of Ericsson	**Nonsense, common sense, and science of expert performance: Talent and individual difference** Ericsson et al (1993) highlights early specialisation and the development of elite performance by deliberate practice. This theory is based upon all performers can be elite athletes and the only characterisation is devoted lengthy motivated practice. Ericsson refrains from referring to physiological make up or genetic inheritance, where there has been

	Author(s)	Year	Theme	Summary
				significant research suggesting that these factors play an important role. Additionally, Ericsson did not find any reproducible evidence to suggest limits to performers within this theory. Ackerman,P.L. (In Press). Nonsense, common sense, and science of expert knowledge: Talent and individual differences. *Intelligence*.
10.	Brylinsky,J	2010	Long term athlete development	**Practice makes perfect and other curricular myths in the sport specialisation debate: appropriate coaching can make all the difference** The debate surrounding sport specialisation is complex and more so a focus should be put on the quality of training and sport skill instruction the athlete. A focus on long term athlete development should be the core focal point to nurture talent. Specifically, the Ericcson 10 year rule would not work if athletes are exposed to hours and hours of practice without stressing appropriate instructional and training context, more so stimulating purposeful training skills with a focus on training context is more important. A focus upon a long term plan that challenges and develops the athlete may that be through multiple sports or a single sport should be considered, of which includes physical and cognitive skills necessary for performance success. The inclusion of deliberate play with a focus on purposely planned instruction to enhance a positive learning environment, the planning capabilities of the coach and emotional support from the coach are equally crucial to the elite performer. Brylinsky,J. (2010). Practice Makes Perfect and Other Curricular Myths in the Sport Specialization Debate. *Journal of Physical Education, Recreation and Dance.* 81(8). 22-25

	Author(s)	Year	Theme	Summary
11.	Mostagavifar,M.A., Best,T.M., Myer,G.D.	2013	Early specialistion, positives and negatives	**Early sport specialisation, does it lead to long-term problems?** The frequency of early specialisation is increasing in early preadolescent children, due to numerous desires including pursuit of school scholarships and professional contracts, to be labeled as talented and the involvement of the media. Early specialisation has shown a link between a decrease in overall motor skill development, which can increase injury risk and can contribute to a lifetime of physical inactivity. This is supported by a study showing that boys involved with diversified activities aged 10-12 performed better in gross motor coordination activities compared with the same age who had specialised in their sport. Generally, sport specialisation contributes to increased injury, dropouts, decreased development of lifetime skill and decreased sport and fitness. Delaying specialisation provides enhanced opportunities for youth development as well as psychological and social development and the opportunity for diverse relationships and experience. This is supported by the research stating that most elite athletes specialise later in life. Mostafavifar,A.M., Best,T.M., Myer,G.D. (2012). Early Sport Specialisation, does it lead to long-term problems? British Journal of Sports Medicine.
12.	Musch, J., Grondin,S	2001	RAE may be a factor to consider in sport performance	**Competition as an impredimentto Personal Development: A review of the relative age effect in sport** Relative age effect (RAE) is a persuasive phenomenon in competitive sports. The RAE can be a crucial factor in whether a player succeeds or not. Older mature children born early in the age year may have an advantage over late maturing younger children due to the selection of school teams and the support and development available to the children. Later maturing younger children may be disadvantaged and may affect later elite competitive sport due to the opportunities and skill development missed during school due to the selection of teams within their age group. Musch,J., Grondin,S. (2001). Unequal Competition as an Impediment to Personal

	Author(s)	Year	Theme	Summary
				Development: A Review of the Relative Age Effect in Sport. *Developmental Review.* 21. 147-167.
13.	Gould,D	2010	Early specialisation	**Early sport specialisation: a psychological perspective: early specialisation does not guarantee later sporting success** The research is inadequate in this area to resolve the controversy over whether athletes should specialise or diversify in their sports at an early age. Sport psychology research has revealed no differences in enjoyment between specialisers and samplers, even though the similarities between the players were similar, the specilaisers were the only group to identify negative issues such as more divers peer relationships and emotional exhaustion. Sport specilaisation studies revealed that in one study swimmers who specialised at a later date advanced at a greater rate than swimmers who specialised early, and found an advantage to early diversification. Additionally, a study on tennis players has found stress, injured, burnout and exploitation to be associated with early specialisation and that there may be many advantages to a limitation to the amount of competitive sport allowed at younger ages which is apparent in tennis tournaments leagues. The success of this has been paramount and has been shown that delaying intense competition can protect the health of the players while strengthening the players at a professional level. There are detailed benefits and detriments to early specialisation, however the argument may be that multiple sports can lead to these benefits and provides an increased number of advantages over early specialisation including developing a range of motor skills that can be adapted to their primary sport. The overarching view must be that young people should have the choice to specialise and should not be influenced. Gould,D. (2010). Early Sport Specialization. *Journal of Physical Education, Recreation & Dance*. 81(8). 33-37.

	Author(s)	Year	Theme	Summary
14.	Houlihan, B	2000	School Sport Development	**Sporting excellence, schools and sports development : The politics of crowded policy spaces** School contribution to elite success is a focal point across England and Wales. Specialist Sport College contribute significantly to achievement but will be far less significant on an effect on elite development. The increased involvement of NGB to pursue their own talent identification and development process may be the cause for this, consequently this can alienate the athlete away from competitive school sport. Athletes do not see school sport opportunities to develop, refine or practice skills, it is seen more as a safety net than development opportunity. Houlihan,B. (2000) Sporting Excellence, Schools and Sports Development : The Politics of Crowded Policy Spaces. *European Physical Education Review*. 6(2). 171-193.
15.	Rees,T., Hardy,L., Abernathy,B., Gullich,A., Cote,J., Woodman,T., Montgomery,H., Laing,S., Warr,C	2013	Review of the identification of talent development to elite performance	**The UK Sport white paper: A systematic review of research into the identification and development of the world's best talent** A position statement in regard to the components of a successful elite performer, organized around three main topics; the performer, the environment and practice around training. Individual sub sections within each section detail the factors necessary to develop to elite excellence. Rees,T., Hardy,L., Abernathy,B., Gullrich,A., Cote,J., Woodman,T., Montgomery,H., Laing,S., Warr,C. (2013). The UK Sport white paper: A systematic review of research into the identification and development of the world's best talent.

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