

# Early or Late Specialisation?

By Mark Lyttle

## Introduction

Demand to achieve results in elite competition has never been higher, leading some to call it a “global sporting arms race” (De Bosscher, Veerle, *et al.*, 2008). More and more countries are willing to invest in sport to achieve success and indeed De Bosscher (2008) has developed a conceptual model for analysing sports policy and the link with success. For Olympic sports, National Authorities are spending more and want more medals to the extent that a price can be put on a gold medal. Hogan and Norton (2000), in studying the Australian system, priced a gold medal at A\$37M and found a linear relationship between money invested in elite sport and the number of medals.

Given this pressure, and the well-publicised work of Ericsson, Krampe and Tesch-Römer (1993) linking accumulated hours of practice with achieving expert performance, many sports are encouraging earlier and earlier participation, often through talent identification and development programmes. This may also be attenuated by high profiles athlete like Tiger Woods and their early specialisation (in the press).

This paper will review the evidence for this early specialisation and whether it is a pre-requisite or, indeed, leads to a better chance of success. It will also outline the negative consequences for early specialisation and whether there is support for late specialisation.

The paper will not review the Long-term Athlete Development Model (Balyi and Hamilton, 2004) as even though those authors present it in the context of early and late specialisation, it is a conceptual model not supported by the empirical results demanded by sports performance analysis.

## Early Specialisation

First of all, it is worth defining what is meant by early specialisation. Wiersma (2000) defined it as when children limit participation to a single sport all year round, with a focus around deliberate practice, as defined by Ericsson *et al.* (1993). The emphasis is on children aged 6 to 12 years who start early in their chosen sport and are involved in early intensive training and competition, although not necessarily as part of a formal programme.

This definition differentiates those children involved in early specialisation from those that may participate, practice and compete in a range of sports often with an intensive focus when all combined.

Côté, Baker and Abernethy (2007) have identified early specialisation as a pathway to elite or expert level based on the above characteristics, as well as identifying another pathway to elite level involving early sampling or diversification in a range of sports including deliberate play in those sports. This latter pathway could also be called late specialisation.

Starting with the early specialisation pathway, Ericsson *et al.* (1993) is cited extensively on deliberate practice and early specialisation (3,931 times according to Google Scholar in December 2013), so that a deeper analysis of what he said is relevant.

According to Ericsson *et al.* (1993), extensive experience in a domain (sports, music etc.) is necessary to achieve expert levels but the level achieved is constrained ultimately by physical characteristics, mental capacity and other innate talents. Improvements are likely to come quickly when practice is started but over time, as the level of expertise grows, the speed of improvement also slows. Ericsson *et al.* (1993) refers to Simon and Chase (1973) and the “10 year rule” of acquiring knowledge and understanding through storing memories of experiences and situations, eventually leading to the attainment of an expert level.

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Ericsson *et al.*'s (1993) research found that no child or adult can acquire expertise without relevant prior experience or practice and there was no evidence of abrupt changes in the speed of acquiring that expertise – in other words there are no short cuts. Maybe more importantly, the performance levels keep improving beyond the age of physical maturation, no matter how early you start.

Deliberate practice takes specific tasks usually on the cusp of the individual's expertise and practices them over and over until expertise is achieved. In this way it is proposed that a higher level of expertise can be achieved than practising the same, mindless routine over and over or, indeed, through unstructured play.

In Ericsson *et al.*'s (1993) graphs of accumulated practice versus age (figures 9 and 12), the lines are clearly not linear but indicate an increasing number of hours practised per annum by older children than younger children. While not disputing the importance of accumulated hours of practice up to peak levels, it is also clear that more hours of practice are done per annum by older children or young adults, which dampens the impact of early specialisation.

Ericsson *et al.* (1993) specifically addresses the impact of early starting age (page 387) but his graph of performance against age (figure 16) is schematic as it is apparently not based on the research data and is used to illustrate his point about starting earlier and indeed his text states "the exact functional form of the curve is not important". Nor does he address whether those starting later could actually overtake the early starters given that the age of peak performance is (well) beyond the age of physical maturation.

Ericsson *et al.* (1993) then also discusses the start age of individuals, rather than the intensity level, to support his hypothesis that an early start results in a higher level of expertise. He presents, at a superficial level, data on starting age in sport rather than the hours accumulated at a young age, the latter surely being more important in supporting early specialisation.

So in summary Ericsson *et al.* (1993) presents strong evidence that number of accumulated hours of deliberate practice is directly related to the level of expertise attained but presents no compelling evidence to show why these hours need to be accumulated at a young age as per Wiersma's (2000) definition. He says it hard to catch-up but does not present the empirical evidence to support why this should be the case given that older children practice more and peak performance occurs after physical maturation.

So while early specialisation is a compelling conclusion of Ericsson *et al.*'s (1993) research on the need for extensive hours of practice, he does not provide the evidence.

Moesch, Elbe, Hauge and Wikman (2011) discuss elite performance through early specialisation in the introduction to their paper, quoting a number of references to support the positive relationship between practice hours and expertise but a review of these references, reveals no reference to early specialisation (e.g. Hodges & Starkes, 1996; Helsen, Starkes and Hodges, 1998; Ward, Hodges, Williams and Starkes, 2004). Indeed the paper goes on to state "there is no consensus that both, early onset and early specialization are required for the development of expertise" (page 283) and a review of some of these references supports this (e.g. Carlson, 1998 and Lidor & Lavyan, 2002).

Baker (2003) states "there is a wealth of evidence supporting the early specialisation approach" but then provides Ericsson *et al.*, (1993) as his only source. Baker's (2003) use of words is also revealing as he says Ericsson *et al.*, (1993) "speculated" that early specialisation was essential (which he did) and "posited" that if training did not begin early enough, late beginners would be unable to catch (which he also did). Baker (2003) correctly states that expert musicians began training around 5 years of age – this hardly supports his early specialisation argument that they began intensive training to the

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deteriment of other activities. Indeed he presents the case of many hours of accumulated practice but little or none for early specialisation, despite stating the evidence is “sound”.

Baker effectively concedes the point in a later paper (Baker *et al.*, 2009) revealingly titled “What do we know about early sport specialization? Not much!”

Bridge and Toms (2013) represent research on late specialisation but in their introduction cited two papers in support of early specialisation in gymnastics (Law, Côté and Ericsson, 2007) and soccer (Ford, Ward, Hodges and Williams, 2009).

Law *et al.*, (2007) provide some credible, empirical data to support early specialisation but their paper also shows the difficulty of getting relevant data. In their study two groups of rhythmic gymnasts, those at Olympic level (n = 6) and those at International level (n = 6), participated in a retrospective study which show early involvement in practice and a reduced involvement in other sports or activities between the ages of 4 and 16, of less than two sports (M= 1.35, SD =0.13). Both groups focussed exclusively on gymnastics from the age of 12 and the entire Olympic group moved location or city to get better training at a mean age of 13.7.

While the study does not support early specialisation using Wiersma’s (2000) strict definition, it does support a significant degree of specialism prior to 12 years of age. Given that gymnastics reach peak performance at a relatively early age, it is not clear whether this can be generalised to other sports. In addition the sample size is small and does not allow for whether it is possible to reach these levels through a different pathway (late specialisation) – in other words is early specialisation a pre-requisite in gymnastics?

There is another issue with the sample in this paper, that may be generalised, is that the two groups were selected based on their then current level of attainment (e.g. Olympic or International level) and past histories examined. There appears little overlap in the hours practiced between the groups (as might be expected the Olympic group practiced more) but at 6 or 8 years of age these were a homogenous group of “talented” gymnastics, all of which eventually reached a relatively high level of attachment, yet the data shows that the eventual Olympic gymnastics were already practicing more. This may suggest an issue with choosing groups of successful athletes for retrospective studies or it may support Ericsson’s model that those that practiced more got to a higher level.

Ford *et al.* (2009) soccer compared the practice and play histories of two groups of elite soccer players, one group of which reach professional level (still elite) and one which did not (ex elite) with an additional control group of recreational players. Both the still elite and ex elite groups practiced more than the control group between the age of 6 and 12 and this appears to support a degree of specialism at an early age. Of course it could be that the elite players had been selected as “talented” and as result practised more as part of their programme. The study does not find whether it is possible to reach the professional level by increasing practice at the age of 12 or 14.

In summary, there is lots of evidence supporting the accumulation of practice and experience as a feature of attaining elite level but little evidence showing the requirement to specialise exclusively at a young age and little account is taken of the structure of the sport in forcing early specialisation or whether it is possible to reach expert level through starting later. Most papers referenced do indicate an early start age but not necessarily early specialisation.

## Link with Talent Identification

It is worth reviewing some of the papers around talent identification as these may provide some insight into early specialisation. A Letter to the Editor of Journal of Sports Sciences, Pinder, Renshaw and Davids (2013) responding to Vaeyens, Lenoir, Williams and Philippaerts (2009) in relation to the

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poor success of talent identification programmes, provides some relevant background and references, citing the one-dimensional, 'physically-biased' attempts to identify world class performers and associated high dropout rates. Abbot and Collins (2004) support this view stating that there is too big a focus on physical characteristics as key whilst not acknowledging that these change over time in children. Pinder *et al.*, (2013) also states the need for more emphasis of talent transfer research to understand domain specific skills versus more generic skills.

Surely this is tacit acceptance or proof that early specialisation is at best only producing world class performers irregularly. Indeed given the changes in children over time, why specialise at all given the unlikely outcome of success as demonstrated in these papers.

Indeed there is little research on the success or otherwise of talent programmes, probably given the secretive nature of many such programmes. Vaeyens *et al.* (2009) acknowledges this and summarises the results of some available research which shows at best a low to medium success rate (Vaeyens *et al.*, 2009 table II, p1371). An additional drawback is the lack of comparative studies with athletes not selected in a talent programme with those in the programme, making it very difficult to draw a conclusion that early specialisation was the key to getting to elite level rather than selection in the talent programme.

## Negative Consequences of Early Specialisation

There are significant downsides reported to early specialisation. It might be expected that significant training in children might lead to overuse injuries and the TOYA study on training of young athletes provide evidence of this (Maffalli, King and Helms, 1994), with over third of injuries relating to training and competition classified as overuse in a two year study of 453 elite young athletes in a range of sports. On the flip side, it is not clear the extent this can be attributed to early specialisation rather than children engaging in lots of sport.

Perhaps the negative consequence most often raised is dropout rates. The contention is that children who specialise early, achieving early success, competing in National competitions earlier are more likely to drop out of their sport completely before reaching senior level. It has been reported by Wall and Cote (2007) in hockey and by Fraser- Thomas, Côté and Deakin (2008) in swimming.

There are also a number of social consequences that might be considered negative which Baker (2003) reviews.

## Late Specialisation (or Early Diversification / Sampling)

Returning to Côté *et al.*'s (2007) early diversification/sampling or late specialisation pathway identified earlier, they identified three stages in a conceptual model or framework for youth development which were sampling (6–12 years), specialising (13–15 years) and investment (16+years). During the sampling years athletes participate in a large amount of play activity across a number of sports. During the specialising years, they participate in similar amounts of play and structured practice in one or two sports. During the investment years they participate in a large amount of structured practice in their primary sport, but a low amount of play activity.

Some of the papers already referenced above (e.g. Law *et al.*, 2007 and Ford *et al.*, 2007) have characteristics of late specialisation (e.g. lack of early exclusivity on one sport and focus on specialising at age 13-15) and number of others, below, have attempted to validate Côté *et al.*'s (2007) model. While the validating the model is appealing given the downside of some early specialisation, these papers are not completely convincing.

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Vaeyens *et al.* (2009) summarised results previously presented by Gullich and Emrich (2006a and 2000b) and supplemented these with new findings. This involved a sample of German ( $n = 680$ ) Olympic athletes across many sports and collected data using a retrospective survey. Putting aside possible issues with such a retrospective survey, they found no indication that earlier and more intense training and competition at a junior level is associated with greater success at senior level. Indeed the world class athletes in the sample as opposed to National standard were more likely to participate in more sports at a younger age and also accumulate less training in their main sport until 15 to 18 (the investment years in Côté *et al.*'s (2007) model). Finally they found a negative correlation between achieving success at a junior level (up to 14 years) and achieving success at a senior level. This appears to support Côté *et al.*'s (2007) framework for late specialisation but there are a number of concerns. There is no data presented by sport and given the vast differences between Olympic sports (from sailing to swimming) it is not credible to draw conclusions that might be applicable to one sport.

Late specialisation is certainly possible as described by Bullock *et al.*, (2009) in a case study of an Australian Skelton athlete moving from novice to Olympian in just 14 months. This would, however, be more compelling in a mainstream sport, with more global appeal, more likely to support generalisation as plausible.

Vaeyens *et al.* (2009) provides background to his paper above and suggests a number of papers to support his findings but a review of these does not provide compelling support. Out of eight papers referenced, the most recent published is 2004 – a long time in elite sport. One of these is Côté (1999) which does present some data on late specialisation for tennis and rowing in a study interviewing elite athletes and while the narrative is compelling but the sample is four athletes.

Another is Carlson (1988) who presents a retrospective study of elite Swedish tennis players, with a control group who were selected based on similar age and ranking at 12 to 14 years. The paper provides evidence that predicting which tennis players will achieve elite status is difficult and that early success does not necessarily lead to senior success. However the elite sample and control group were already nationally ranked tennis players at 12 to 14 years, so it appears that both groups were to some degree early specialisers to be nationally ranked at that age.

Vaeyens *et al.* (2009) also states that it is generally accepted that the “early specialisation model is apparent in some sports” and refers to Ford, Le Gall, Carling and Williams (2008) as support. Ford *et al.*, (2008) compares French and English soccer academies and represents evidence of differences between the two – specifically that the French system has some more characteristics of the early specialisation model (they were more likely to focus exclusively on soccer) and this provides support for the early specialisation approach as the French are better at football. While this statement is far obvious and both the English and French players in his sample reach elite status, it surely supports late specialisation as much as early specialisation.

As with early specialisation, it appears there is little compelling evidence to support late specialisation as the prevalent approach. The best it can be said is that there are examples of late specialisation in several sports.

## Conclusion

Early and late specialisation models received much attention around which is best to achieve elite level in sport. In reviewing the relevant papers, there is much evidence to support the view that many hours of accumulated deliberate practice and experience in a sport are required to reach elite level and the level of expertise achieved is directly related to the hours accumulated.

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Most athletes who reach elite level start at an early age, whether in a multiple sports or just one. While these early starters start accumulating hours sooner but there is little empirical evidence to say that either the late starters can't catch up or that early specialisation, under a strict definition, is a pre-requisite or has a higher success rate.

Instead it appears that no one model is prevalent and success to achieved across a "continuum" of these approaches. The conclusions drawn by papers often only support to some degree the relevant approach and appear to depend on their definition of those terms.

Many young children interested in sport, are likely to play many sports, some of them intensely at a young age and sometimes in a play environment and sometimes not. It is therefore not enough for researchers to say "they started early" – of course they did. But did they specialise early and exclusively, according to the definition? Also how intensively did they participate at a young age?

Some research is based on samples in a board range of sports but each sport is different in terms of the age of peak performance, the physical and mental skills needed, the degree and complexity of sports specific skills and the structure and organisation of the sport itself. Conclusions drawn from this type of sample appear flawed.

Much of the evidence that is presented compares different sub-groups of elite athletes and it appears that this is due to the difficulty of collecting longitudinal data that includes athletes that reach elite level and those that do not as it is hard to predict those that will reach elite level in advance. Indeed Abbot and Collins (2004) refer to the lack of enthusiasm for long term studies due to the funding complications.

The research on early and late specialisation appears not to have provided the empirical evidence to support either approach and combined with the inconsistencies prevalent in using these terms, it is probably time for researchers to stop using these terms. Early or late specialisation? It is not clear what the question means to many researchers.

In summary, each sport may have early bloomers (like Tiger Woods) that process all the dimensions of "talent" at an early age that allows them to specialise early but in the absence of compelling evidence to prove they are the rule, they may be the exception.

Given the downside risks with early specialisation in a strict definition and the lack of a compelling case, maybe the question should be what transferable skills should be developed in young children to allow to allow them to excel in a specific sport later on as teenagers and which sports are open to this in their structure and organisation? Also identifying using empirical evidence, which specific skills cannot easily be developed at a later age and which sports they are needed in, thereby taking the conceptual Long-term Athlete Development Model and validating elements in a specific sport. This area could provide the basis of a follow on review.

## Biography

Mark Lyttle developed an interest in sports science when campaigning, full-time, in the Laser class, for the 1996 Olympics. He is currently finishing an MSc in Sports Performance Analysis at Middlesex University. Mark started sailing Optimists at the National Yacht Club, in Dublin and has raced in Optimists, Lasers, 470s, J24s and 1720s. He was All Ireland Sailing Champion three times. Mark competed at the elite level in sailing for over 20 years, reaching 16<sup>th</sup> on the Laser world rankings in 1996, finishing 11<sup>th</sup> in the 1996 Olympic Games (and winning race 3). He also won a silver medal at the inaugural ISAF World Team Racing Championships. He now enjoys cycling and triathlons. He is Optimist Class chairman in the UK and on the committee of the Anaconda Swimming Club. He lives in London with his wife and three sons (and several Optimists).

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