The Training of Young Athletes (TOYA) Study published in 1992 - 1996, was commissioned by the Sports Council in 1986 following growing concern about the negative effects of intensive training on children. There was much anecdotal evidence at the time suggesting cases of overtraining and competitive pressure leading to young athletes premature retirement from sport through physical and psychological "burn-out", though little scientific evidence was available to validate these impressions.

The Sports Council commissioned the TOYA Study to increase our understanding of the physical and psychological pressures faced by the elite young athlete. The study, however, is equally concerned with the positive as with the negative outcomes from a lifestyle committed to sporting performance.

TOYA was a longitudinal study. The longitudinal method consists of measuring the same individuals at different intervals over a specific period of time. Although all young athletes chosen to take part in the TOYA study were seen on three separate occasions, at yearly intervals, they entered and left the study at different ages. This type of longitudinal method is called a linked longitudinal design. It incorporates five age-groups or cohorts involving pre-pubertal, pubertal and postpubertal children.

The children were selected from within a 300 mile radius of London. Such a large catchment area ensured that there was no regional bias and makes TOYA a truly national study.

The basic criteria for inclusion in the study were:
- that the athletes trained for a specific number of hours per week, and/or:
- that they had performance success to a specified level in the past or had the potential to
do so in the future.

Coaches were contacted and a data-base of eligible children developed for each sport. Young
athletes were then selected at random and their parents contacted by letter inviting them to take
part in the study. The sample is therefore representative of what coaches consider to be elite,
highly trained young athletes who participate in football, gymnastics, swimming or tennis.

The age at which young children begin intensively training varies depending upon the
requirements of each sport, and therefore the design of the study had to be sensitive to these
sports-specific differences. Consequently for the sample of gymnasts the youngest (born in
1979) entered the study at eight years of age and the remainder were spaced at two year
intervals up to, and including, 16 years of age. The sample of tennis players ranged from 8 to
16; swimming 10 to 16 years; soccer 12 to 16 years. Because of the longitudinal nature of the
research design the study will have data on pre-pubescent, pubescent and post-pubescent
children whose ages ranged from 8 to 19 years.

Of a more specific nature the selection includes examples of a racquet sport (tennis), a contact
team sport (football), a sport requiring local muscular endurance and stamina (swimming), and
one characterised by flexibility and explosive strength (gymnastics).

In all the total sample was 453 young people; Football = 64 (male only), Gymnastics = 119,
Swimming = 114, Tennis = 156

What did TOYA measure?

The following measurements were repeated at yearly intervals when the children visited the
Institute of Child Health, London:
1. An assessment of growth and maturation involving measurements of height, weight and pubertal stage (16). Fatness as a percentage of body weight was calculated from four skin folds. Measurements of body dimensions were also recorded.

2. A medical examination recorded both the child and family's medical history. Current health and injury problems were diagnosed and classified as to whether sports related in origin. Information on the site, severity and treatment of any sports related injury was noted.

3. Muscular strength was measured by evaluating the isometric strength of two muscle groups - the biceps of the upper arm and quadriceps of the upper leg.

4. Flexibility of the athletes was determined by measuring the range of movement around four major joint areas, the spine, shoulder, knee and hip joints.

5. An assessment of cardiorespiratory fitness involving measures of maximal oxygen uptake and lung function was recorded. Maximal aerobic power (V02 Max) acted as the criterion of cardio-respiratory fitness. VO2 Max was measured by a progressive incremental running test on a treadmill. Respiratory function was determined by measuring the size and performance of the lungs.

6. The psychological status of the children and their parents was measured using a number of pencil-and-paper self report questionnaires. Psychological status involved measures of behavioural and emotional problems, self esteem and family functioning, and attitudes to eating. Additional psychological measurements included an assessment of each child's intelligence quotient (IQ), and educational attainment. These measures were only taken in the first year of testing.

7. Further psychological information was obtained from a single interview conducted at home with both child and parent. Here marital relationships were assessed. Patterns of friendships, attitudes towards eating, education and sports involvement were all recorded using a semi-structured interview technique.

8. A health diary was sent to all children on two separate occasions. Each diary lasted for 28 days and was used as a prospective device to monitor the frequency and severity of minor health problems - coughs, colds, and headache for example. Injuries, visits to the GP and medication were also recorded.

9. Every athlete's coach was interviewed at home during the final phase of the study. Coaching styles were determined by classifying the coaches' behaviour and beliefs. Information was also collected on the coaches' knowledge about child growth and development, prevention and treatment of injury and age appropriate thresholds of intensive training. The personality of coaches was also measured using a self report questionnaire.

10. As it was not possible to visit at home children who had retired, a telephone interview was used to collect information from them. The interview was designed to establish why the child gave up, and to describe any advice given by coach or administrator to help at the time of giving up. Attitudes to future sports participation were also recorded. Children from different sports were compared and any differences established. Attempts were made to identify factors which might assist the coach to identify those who will drop out, and, where appropriate, devise strategies to discourage retirement.
The following is a summary of findings from the TOYA study;

TOYA and the Identification of Talent

How and why did the young athletes become involved in youth sport? The TOYA report describes the role parents, schools and coaches play in identifying talent. The cost of intensive training, the availability of facilities and the unique characteristics of sporting families are also described;

The TOYA findings suggest that talent identification in this country is heavily dependent on parents and the motivation of the children themselves. Sports clubs and coaches generally play a secondary role in identifying talent - they can only select those children who are encouraged to participate by their parents. These data suggest that there are many more children who could enjoy the health related benefits of sports participation, and who may also be talented, but parents, schools and also coaches have not given them sufficient encouragement to do so. Children with potential are not being identified and some young athletes participating in intensive training may not merit specialised coaching to accelerate development. Many children in sports like gymnastics, swimming and tennis are not identified by a professional as talented. This raises a number of questions as to whether the child is especially suited to a particular sport and whether the time, effort and cost of intensive training is worth it if they stand little chance of reaching performance goals.
Recent developments (1992) within youth sport indicate that this situation may be changing. With the introduction of mini versions of many sports it does seem as though governing bodies are giving greater incentives for more children to take part and in so doing increase the opportunity for a coach to identify performance potential. The following summarises the TOYA findings:

Parents play the main role introducing children into sport. Most parents had participated in sport themselves when younger though not necessarily in the same sport.

- With the exception of football, talent identification relies heavily on parents and the children themselves.
- The talent identification system in this country appears closed, excluding many children from entering sport at a later age.
- There are inequalities in access to intensive sports participation particularly amongst lower socio-economic groups and one parent families.
- The cost of intensive training can be considerable and is met almost exclusively by parents. Although most can afford to support their child's involvement some families experience financial hardship.
- Children have to travel considerable distances to get to the training facility and most are dependent on parents for transport. Few parents had organised a rota system to reduce the demands on their time and resources.
- The average starting age across the four sports is uniformly young, on average between 6.3 and 7.6 years. Intensive training starts 2 to 3 years later, between 8.6 and 9.5 years.
- Females tend to start sports participation slightly earlier than boys in gymnastics and swimming. In tennis the trend is reversed. On average boys start participating 12 months earlier than girls.

TOYA and Education
Children involved in intensive training were less likely to experiment with cigarettes and alcohol. Because of their active lifestyle, they are less likely to spend as much time watching television. Young athletes are less likely to experiment with smoking and consume less alcohol at an early age. Unfortunately, these benefits are not open to all young people. Social class and family type were found to exert some influence on the health-related benefits of intensive training. Young athletes appear to be more resilient to stress and able to cope with the pressures of training and competition. The TOYA findings suggest that young athletes do well at school, and that anecdotal reports of adverse effects on their performance are unfounded. Although many young athletes experience occasional absences from school due to illness or injury, they are not at risk of developing a clinical eating disorder such as anorexia nervosa. Certainly, there were parents and coaches who pressurised their children to lose weight, but whether this will have any effect on the eating behaviour of these children when they give up sport has not been determined. It does seem that emotional and physical well-being are not affected by the intensity of training, although there is a need to monitor the diet and nutrition of young athletes, particularly gymnasts and tennis players, who appeared more likely to take antibiotics for infections to the ear, nose, and throat.

Young athletes perceive their families to be closer, more supportive and more adaptable. The emotional and psychological characteristics of the families of athletes adaptability and cohesion. It is not possible to say whether these are a cause or consequence of their child's sport participation. The young athletes tend to produce better public examinations results than a comparable group of children from the general population. A greater percentage of the young athletes reported being teased significantly more than other children their age. Footballers in particular reported being teased more often. Anecdotal evidence suggests that young athletes are more likely to experience severe bullying than a comparable group of children. Despite these problems, the young athletes tend to produce better public examination results than a comparable group of children from the general population. A greater percentage of the young athletes reported being teased significantly more than other children their age.
The aerobic fitness of female tennis players tended to remain constant with age, in contrast to untrained female children whose aerobic fitness declined with age after body weight had been flexibly to the playing arm.

Flexibility was found.

Age of 17 years male swimmers and tennis players were taller than footballers and gymnasts. The health-related benefits of intensive training appear considerable. Gymnasts were found to be smaller and same age. Although tennis is not a predominantly aerobic sport, tennis players were found to have no evidence to suggest that maturation was affecting aerobic fitness levels.

Characteristics. The positive relationship between mother’s and daughter’s age of menarche did not reflect the sport-specific effect on growth and physical fitness. Gymnasts were found to be smaller and same age. Although tennis is not a predominantly aerobic sport, tennis players were found to have no evidence to suggest that maturation was affecting aerobic fitness levels.

Emphasis will be given to describing the effects growth and maturation have on the development of fitness. The effect sport-specific training regimes have on fitness will also be described by their coaches as training intensively.

Governing bodies of gymnastics and swimming (1992) do not appear to provide any recommendations or guidelines as to when young children should start intensive training programmes for the young. In all four sports, young athletes were involved in training for a single sports discipline was thought to be at an increased risk of overuse injury, a previously rare phenomenon in childhood. In this study it was found that 15% of all the athletes sustained overuse injury. However, further research is still needed to establish the effect sport-specific training regimes have on fitness will also be described by their coaches as training intensively.

The site, severity and frequency of injury will be described and injury patterns from the four sports will be compared to non-exercising children. TOYA, Physical Fitness and Growth subjects receiving any financial assistance. Only in football did the majority of injured athletes come from coaches. Nearly half these injuries required further treatment, again usually by a physiotherapist.

The majority of injuries sustained by athletes occurred outside their specialist sport and in swimmers this accounted for 50% of the total incidence of injury. Of the injuries that occurred outside the specialist sport, over half were the direct result of some other sporting activity.

Additional research is now necessary as the impacts of intensive training at an early age could manifest themselves in later life. Repeat surveys on the athletes in adulthood could help to identify areas outside the coaches’ immediate sphere of influence which the governing bodies of sport may need to address. Of course different coaches experience different constraints, but most share the same understanding of what constitutes ‘intensive’ training. For some this may mean over-training, which may result in physical or psychological harm, for others it is a means of developing the potential of all young athletes, and high quality and quantity of training is required to develop the potential of all young athletes, and high quality and quantity of training is required to develop the potential of all young athletes, and high quality and quantity of training is required to develop the potential of all young athletes.
The availability of financial resources from parents increases the chances of high performance sport, not least because it attempts to explore the lived experiences of young people in (first stage) performance sport that will have resonance for many young athletes. What it does do, is suggest some thematic directions for further study by students of sport administration, coaches and governing bodies who sponsor and support young athletes in their desire to achieve success. The survey also indicated that there may be ‘sensitive’ periods when a young athlete may be more vulnerable to making the decision to retire, perhaps prematurely. One such time may be to retire is made voluntarily or because the athlete is forced to withdraw because of illness, injury or what appear to be mental health problems. The results of the survey suggest that most young athletes appear to cope very well with the retirement process as for many retirement did not involve total withdrawal but a significant number changed their involvement and took up new sports or activities. The results may have been different and the variations between groups are not great. Some negative findings in female gymnasts are also of interest, and it is possible to measure various physical and psychological factors such as IQ and physical fitness and relevant results have emerged. These may be summarised as follows:

- It should also be noted that if a serious attempt is to be made in the future to achieve a reliable and valid way of screening out potentially highly successful athletes, an improved research design may be needed. For instance, the TOYA study was not designed to predict performance outcome, some important research questions remain unanswered and the relative importance of IQ and generalisation of IQ assessment to the sports domain still needs to be determined. Whether the IQ assessment, if carried out properly, is time-consuming and expensive, is still a matter of debate.

- Although the TOYA study was not designed to predict performance outcome, some important research questions remain unanswered and the relative importance of IQ and generalisation of IQ assessment to the sports domain still needs to be determined.

- Historically sport has been seen as an accepted and permissible outlet for aggression. The carthartic role of sport has been suggested or implied since Victorian times. In today’s sport, the idea of aggression in young athletes is a more complex issue. The great majority of young athletes did not perceive themselves as aggressive in their day-to-day lives. Although many athletes were fairly happy with their level of competitive aggression there were some who were dissatisfied with their ‘fighting spirit’ and wanted to change it. Why do some young athletes want to increase their level of competitiveness? Is there a difference between sport and sport? The survey cannot answer the question as to whether children in sport are at risk of displaying physical aggression, yet this was defined as ‘going in hard’ or winning ‘fifty-fifty’ balls or events. Most described competitive aggression in terms of determination, concentration and a will to win. Young footballers felt they were more likely than any of the other three sports groups to display physical aggression, yet this was defined as ‘going in hard’ or winning ‘fifty-fifty’ balls or events. Changing aggression meant increasing determination, confidence or the will-to-win. For many of these children it was a significant number who wanted to be more aggressive. For many of these children the pressures on the young athlete to perform well are great and the mental skills required to succeed are considerable. The pressures on the young athlete to perform well are great and the mental skills required to succeed are considerable.

- It is important to emphasise that this study produced findings on attitudes and beliefs, not on actual behaviour. The data were collected in a controlled environment and most respondents are likely to give a more socially desirable reply than one would expect if one observed them in the laboratory. With this proviso, these data seem to suggest that fears surrounding the decline in standards of fairness in sport may be unfounded. Many athletes wanted to change their level of aggression but by improving ‘mental skills’. The findings did suggest that in some cases adults do not feel that they can deal with competitive aggression but by improving ‘mental skills’.

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