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 (VO2 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? 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.

Read more...

**TOYA and Education**
Because of their active lifestyle, they are less likely to spend as much time watching television as children not involved in intensive training.

To change than children who do not take part in sport.

socio-economic groups and one parent families.

likely to experiment with smoking and consume less alcohol at an early age. Unfortunately considerable influence upon the opportunity to participate in sport, particularly amongst lower studied intensive training had a significant effect on the lifestyle of the young athlete and his or her family. These young people devoted a considerable amount of their free time to training but probably because of the time spent training.

TOYA and Lifestyle

with their weight and had menstrual irregularities probably related to limited food intake, only role in protecting them from depression . The young athletes perceive their families to be closer, competition and just under 10% (27 athletes) reported more severe anxious behaviour which could result in the avoidance of the competition situation.

the stomach' or some feelings of restlessness.

tended to experience only mild anxiety or arousal, usually characterised either by 'butterflies in

take pain killers.

athletes. Anecdotal reports of parents and coaches forcing or pressurising the child to lose much care needs to be taken with the diet and nutrition of the young generally but particularly for those involved in intensive training.

pressurised their children to lose weight, but whether this will have any effect on the eating weight seem generally unfounded as most athletes made the decision to diet or avoid meals themselves. When this happened parents seemed genuinely uncertain as to how to cope.

for those involved in intensive training.

It does seem that the behaviour of these children when they give up sport has not been determined. It does seem that two thirds of the sample described their daily health as above average. Very few appeared to sports participation affords them protection from illness.

The information described in this report suggests a sports-specific relationship between intensity of training and emotional and physical well-being. Rates of emotional and physical health problems were compared.

There is no evidence to suggest that intensive training affects the young athletes' ability to

Young athletes spend a considerable amount of their leisure time training and competing.

Despite having to make sacrifices many parents felt their involvement in sport

Social class and family type exert considerable influence on young people's opportunities

TOYA sample may contribute significantly.

Finally, although they were not investigated, during the course of the study a number of

Although a number of young athletes, particularly girls, avoided food, were dissatisfied

For many young athletes the close, supportive family environment played an important

Young athletes appeared to be less at risk of depression than children in the general

Most young athletes reported feeling no nerves or anxiety before training. Those who did

Over two thirds of the sample described their daily health as above average. Very few

general health status. It is interesting to speculate whether young athletes have more resilience

compared.

Little is known about sports related health problems. We in this, describe the relationship

between intensity of training and emotional and physical well-being. Rates of emotional and

athletes. However, for most children sports participation appears to be a low risk activity. Over

Training has little regular effect upon school attendance. Competition is more likely to

of school and training and the resulting problems described by the young gymnasts.

Most studies have tended to concentrate upon the effect of children's participation in school

training are also described.

The results suggest that the main area of concern for these children is not the relationship

children. Over a third attributed being teased to their involvement in sport. Gymnasts and

expected from IQ results which fell within the normal range. These data tend to suggest that

examination results than a comparable group of children from the general population. A greater

Despite these problems as a group the young athletes tend to produce better public

training and competing, these do not occur on a regular basis and are unlikely to have an adverse effects of intensive sports participation on schooling and examination results appear
in untrained males. Tennis players generally showed a possible sport-specific adaptation of flexibility to the playing arm.

flexibility.

flexibility in their lower limbs, less so in the upper limbs.

account gymnasts were found to be stronger than the other athletes. They showed considerable fitness. In males there was an increase in aerobic fitness towards the end of puberty, an effect have slightly higher values than those found in untrained children and adolescents. It was also found that in the latter stages of pubertal development males had a significant additional of strength and flexibility than the other athletes. Swimmers and footballers were found to have lower levels of body fat than untrained children and they were also physically fitter in terms considerably higher levels of aerobic fitness than untrained children and adolescents of the

suggest that some sort of genetic cause was operating, but the findings are not conclusive in this respect.

is not known whether this was a result of their training regimes or a genetically inherited

This TOYA (1992) report addresses the effect intensive training has on physical fitness. It

Emphasis will be given to describing the effects growth and maturation have on the

TOYA, Physical Fitness and Growth

injuries that did require treatment over three quarters were treated at the time of injury, with the
days' training, while another third caused the loss of less than 14 days. Overuse injuries were

overuse. Only in swimming did overuse injuries account for the majority of sports injuries.

safe and that the great majority of injuries occurring were minor and self-limiting.

Although the prevalence of injury amongst the athletes studied was lower than might have been

expected, it must be stressed that even one preventable injury is one too many. However, it is

athletes were due to acute trauma rather than overuse. However, it was found that overuse

The results of the TOYA study show that the majority of injuries experienced by the young

involved in training for a single sports discipline was thought to be at an increased risk of

incidence of injury and intensity of training. Although a number of overuse injuries were

programmes were described by their coaches as training intensively.

described the number of hours young athletes should train per week. Many were not prepared

to start intensive training and the actual ages of the TOYA athletes. In all four sports, young

achievers in particular. This not only safeguards the physical and emotional health of the young

child, but it also identifies areas outside the coaches' immediate sphere of influence which the

smooth transitions rather than episodic bursts of intense physical, technical and psychological

psychological problems, whilst others may be under-training, which may affect the development

The intensity of an athlete's training regime is usually determined by the number of hours he or

their parents have a shared understanding of what quality and quantity of training is appropriate

for young people. The lack of any agreed standards which can be used as guidelines when

with coaches will be used to identify age-appropriate thresholds of intensive training. Coaches
The survey also indicated that there may be 'sensitive' periods when a young athlete may be making the decision to withdraw. A further factor is the degree to which the athlete felt he or she gave the matter some considerable thought. From the perspective of sports administrators, coaches and governing bodies who sponsor and support the sport, understanding the decision-making processes that occur at this critical juncture is of increasing importance. 

The TOYA study has shown that the type of sport had a significant effect on young athletes' attitudes towards winning. Tennis players were more likely to describe general aggression in terms of anger, whereas footballers and swimmers thought aggression was more cynical - involving cheating, rule-bending or violence. However, it is important to emphasise that this study produced findings on attitudes and beliefs, not on real life situations, it may well be that rates of cynical and angry aggression in competition are higher than the survey suggests.

It is obvious that it is possible to measure various physical and psychological factors such as training knowledge, motivation, skills, and a will to win. Young footballers felt they were more likely than any of the other three sports to cheat or bend the rules are also described. With this proviso, these data seem to suggest that fears surrounding the decline in standards of competitive spirit and a will to win. Young footballers felt they were more likely than any of the other three sports to cheat or bend the rules are also described. With this proviso, these data seem to suggest that fears surrounding the decline in standards of competitive spirit and a will to win. Young footballers felt they were more likely than any of the other three sports to cheat or bend the rules are also described. With this proviso, these data seem to suggest that fears surrounding the decline in standards of competitive spirit and a will to win.

Although the TOYA study was not designed to predict performance outcome, some important and relevant results have emerged. These may be summarised as follows:

- In this case promising athletes who are later successful and its specificity (capacity to identify risk and performance is obviously another requirement for success and this is only likely to be achieved if the athlete is willing to train hard and focus on performance. Consequently event does not go as expected, the weather is inhospitable or there is a concern about a minor injury. There are a multitude of unexpected events that can occur, and athletes who are resilient and flexible in their approach are likely to have a considerable advantage.

- Competitive situations often confront the athlete with unexpected problems - the weather is bad; the player's performance is not up to par; the opposition's tactics are unexpected; the opponent is injured. In this case, the athlete must adapt to the situation, and this requires a high degree of mental toughness.

- The great majority of young athletes did not perceive themselves as aggressive in their day-to-day lives. However, during competition they felt it was acceptable to be aggressive in order to win. This is in line with the findings of previous studies that highlight the role of aggression in sport success. Therefore, the decision to participate in competition and the ways in which they perceive aggression may vary depending on the context and the athlete's beliefs and values.

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- This report looks at young athletes ideas about aggression in sport and everyday life and describes the sport-specific nature of athletic aggression. The pressures on the young athlete to cheat or bend the rules are also described.

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