

Limits on Young Gymnasts' Involvement in High-Level Sport

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In the light of recent, extensive work and research on the physiology, psychology and pathologies of sport in general and gymnastics in particular, and in response to certain controversies, many of them sparked by media sensationalism and totally devoid of any scientific basis, we shall try to take a rational look at the effects of intensive training on young gymnasts. We will cover not just the positive and beneficial aspects, but also the dangers, and so identify the limits and reservations—in short, define the conditions, and they are strict ones, which apply in this area.



Respect for childhood and children themselves, for their mental and physical health and their future must be our only concern; psychological and medical experience are obviously important, but reason and ethics must also guide, direct, restrict and even, if necessary, lead to a ban on this kind of sporting activity, which is actually limited to a very small group of exceptional young people who sometimes defy the physiological and psychological norms and whose very special talents will be amply demonstrated and constantly scrutinized. Although general criteria can be used to identify the limits of these talents, individual and specific factors must also be taken into consideration.

Everything we say will center, of course, on the main thing which characterizes this stage in life, that is growth. This is an eminently favorable time for learning and for taking up many activities which depend above all on psycho-motor skills. It is a well-known fact that the things we learn in childhood are learned far more easily and better, and are less likely to be forgotten, than the things we learn as adults. Indeed, some things can only be learned at a very early age—after that, "late" can soon become "too late." Virtuoso musicians always start on their scales very young, and the same is true of prima ballerinas taking their first steps, or brilliant linguists first setting out to master the subtleties of another language. It is certainly a favorable time, but it is also a time when things are being built and therefore a time of fragility, instability and of physical and psychological upheaval.

We know that the consequences of simply engaging in a physical or sporting activity are nearly always beneficial in the short, medium or long term. But choosing the activity, and deciding on its level, frequency and intensity become a far heavier responsibility, even though our scientific knowledge, ethical sense and reason can guide us, once we know that

any activity embarked on in childhood or adolescence can affect adult life, sometimes deeply. Whether the effects are favorable or unfavorable depends on the quality of the activity and on the way in which it is pursued.

The title of this paper introduces two concepts, which call for fuller definition, those of high-level gymnastics and age.

The Concepts of High-Level Training and Gymnastics—The "Status" of High-Level Sport

"High-level" must not be defined simply in terms of time spent training in the gym, the quantity and quality of the effort involved, the technical level of the performance or the results achieved in competition. "High-level" must cover not only the athlete's relationship with gymnastics, but also the whole environment surrounding the discipline, on which success often depends. High-level sport is also a way of life. The notion of an elite indicates, as I have said, that we are dealing with exceptional people, who have passed through a process of medical, physical, psychological, technical and ethical selection (sometimes, alas, natural selection as well). All the mistakes, accidents, interrupted or broken careers, and even tragedies come from forgetting, underestimating or refusing to accept this fundamental idea. Very few young gymnasts can reach this high level, and their progress towards it should be based on extremely rigorous and constantly verified criteria; far too many of them, however, are driven and pushed by unscrupulous or incompetent coaches (sometimes, alas, doctors too), or even by irresponsible parents, although they lack the qualities and even the environment and conditions needed to engage in sport at this level.

The Concept of Age

Paradoxically, age is of very limited and debatable interest when it simply denotes chronological age, or the age shown on official documents. The latter is, in fact, of very little use in measuring a gymnast's level of maturity against a standard yardstick, comparing several gymnasts, classifying them and organizing category-based competitions (seniors, juniors, etc.). There can be surprisingly wide differences and discrepancies in pubescent maturing, and principally muscle power, between competitors of the same legal age, and especially between young people from different population groups or parts of the world, since, as we shall see, many environmental factors can encourage these disparities in development.

Physiological age would be a much fairer and more logical basis for comparing individuals and enabling them to compete on equal terms; this would entail referring to a wide range of criteria and carrying out various tests: somatic tests (age in terms of stature), clinical tests (determination of the stages in pubescent development), biological tests (hormone level), x-rays (bone age, etc.). These tests are very useful in keeping a regular check on the maturing process, but do not always indicate physiological age with sufficient accuracy to determine competition categories, since findings and standards are open to exceptions, when the subjects themselves are exceptional.

It is also vital to bring in the concept of "psychological age," here again, the criteria need to be placed in the same kind of environmental context.

Growth Factors

These are mainly endocrinous; the nervous system and especially the hypothalamus, the cerebral command structure, restrain or stimulate the secretion of hormones - principally the growth hormone GH, the thyroid hormone, sex hormones (androgens and oestrogens), cortisol and glucocorticoids, insulin, somatomedins (ILGF) and other factors. These hormones are secreted by different glands and each one has a specific target (bones, cartilage, nervous system, etc.).

Many very up-to-date studies clearly show changes in secretion of these hormones which are directly linked with exercise and also connected, over a period, with the accumulation of physical effort and training pressures. Some studies have focused specifically on gymnastics, but the sport seems to have no distinctive effects in this area; the organism does not "recognize" it as having any special hormonal effects, which means that all the criticism leveled at this sport—particularly by the media, are totally unfounded. Before they say anything, the critics should thus substitute the general term, "practice of sport" for "gymnastics" and stop making our sport their target. When we think strictly of hormones, "physical activity in general" is the only meaningful concept, whereas, when we come to consider pathology, and particularly osteo-articular pathology, we shall describe things which are indeed specific to our sport.

Nevertheless, we should briefly note that every effort leads to an immediate increase in the circulating growth hormone, associated, depending on its duration, intensity and repetitiveness, with a rise or fall in the level of somatomedin (IILGF), one of the essential hormone regulators. The hypothalamus may also react by reducing the secretion of male hormones (testosterone) and female hormones (LH and FSH), especially if certain negative factors, such as nutritional deficiency or unfavorable environmental conditions, are present as well.

There is, therefore, a quantity of effort above which certain secretions are reduced and growth may slow down, the latter being reflected in objective signs—the subject's being behind in bone age, size, the clinical stages of puberty, delayed onset of menses or menstrual disorders, etc.

Fortunately, all the research clearly shows that, with very rare exceptions, a "catching-up" process always remedies these delays or disorders, either during rest periods or at a later stage which is why we have to give serious thought to the scheduling of training and rest periods in the short and medium term.

"Internal" Influences On Growth

These are the genetic factors. They may be important additional criteria among the many on which gymnasts are selected and recruited. Very little is yet known about these genetic factors; we do know, of course, that children of small parents are far likelier to be small themselves—so why blame small stature, as some people do, on sinister manipulation or the harmful effects of gymnastics! But apart from size and a few minor criteria, we still do not know a great deal in this area. We can take it that the incredible progress made in genetics will very soon be contributing to the selection process, but we shall have to stay vigilant to prevent abuses and firmly reject certain "projects" which still lie within the realm of science fiction, but may one day become realities.

Genetics can save mankind, and can help sportsmen and sport, but genetics can also destroy. In sport, unscrupulous genetic manipulation gives us good reason to fear the worst.

"External" Influences On Growth

These are many and various and have powerful effects on development; climate, and particularly exposure to sunshine and light. A young South American or Central African girl matures far earlier than a young girl living in the far north of Europe, all exceptions proving the rule. This has nothing to do with physical exercise, but is simply due to a natural time lag. The growth rate is normal in both cases, but the time-span differs. This alone shows how hard it is for an international institution like ours to take legal age as its sole criterion for harmonizing, comparing and bringing groups of young people together to compete with one another, when their qualities and capacities are so dissimilar.

Since we have mentioned sunshine, light and their stimulating effects on growth, we might as well make the point here that some gymnasts spend too much time shut up at home, in school and in the gymnasium, and need these things vitally too. Sunshine and light are essential to their development and health: the synthesis of Vitamin D, through the action of ultra-violet rays on the skin, plays a vital part in building bone calcium.

Illness, especially chronic illness, also interferes with healthy growth. The negative influence of certain social factors can also be mentioned: certain psycho-affective disorders linked with family or training or certain environmental conditions (lifestyle, family habits, school boarding, etc.), and nutrition (the disastrous effects of certain deficiencies on growth are well-known). On the other hand, physical activity in general is recognized as being a very favorable external factor.

Q & A

HIGH-LEVEL ATHLETES DO, HOWEVER, DISPLAY VARIATIONS FROM THE NORM OF THE DELAYED PHYSIOLOGICAL DEVELOPMENT TYPE; these are linked to the external and internal factors previously described, but the main cause seems quite simply to be intense and repeated physical effort.

In the absence of intercurrent illness, these disturbances and delays should be seen as variations in development and not disorders. This indeed is an issue which certain media, educationalists and doctors who lack a proper scientific grounding are quick to seize on for polemical purposes, although the few simple points we have made above provide ready answers. Questions repeatedly asked include the following:

Q. Does the specific and intensive practice of gymnastics limit growth, and therefore adult height?

A. No, artistic gymnastics does not stunt growth, any more than competitive rhythmic gymnastics stimulates it, although height differences between the practitioners of each are considerable. The explanation lies simply in genetics, natural or organized selection and the spontaneous and logical success of the morphologies best adapted to one sport or the other. It is certainly true, as we have seen, that intensive training in general, and not only in gymnastics, may slow growth, but the catching-up process, which is more or less constant, always cuts in at some point, whether in the short (rest periods), medium (holidays) or long

term. Growth is normal, but spread over a longer period.

Q. But doesn't the practice of gymnastics cause certain disorders, such as delayed bone structure development, late menstruation, menstrual disorders, etc.?

A. No, there are no disorders which can be specifically ascribed to gymnastics. The fact is, that any form of intensive physical exercise can reduce the growth-rate, slow down maturing of the bones and so delay puberty. I repeat, growth goes on for a longer period. More and more frequently, too, the specific environmental factors such as diet, climate, travel, stress and various psycho-social factors which affect many gymnasts are found to apply equally to people who lead entirely sedentary, sport-free lives. A balanced diet and physical and mental hygiene are at least as important as good training and are necessary to reach the "catching up" phase, when these irregularities are completely corrected with no after-effects.

The Physiological Growth Process—How It Can Go Wrong

A number of thoroughly objective and quantifiable criteria, which are influenced by external and internal factors, can be used to monitor the growth process. Thus we follow somatic development (height/weight), the development of bone structure (bone age provides a useful indication of the general development stage), of cartilage and of muscle volume; we follow psycho-motor development, the subject's relations with others, the onset and evolution of menstruation and particularly the appearance of secondary sex characteristics (the development of pubic hair, breasts and external genital organs) which, if they are regularly checked and the results compared between examinations, provide an excellent indication of the rate and quality of hormonal secretions.

Practical Conditions and Limits of High-Level Training for Children and Adolescents

These conditions and limits are physical and, obviously, psychological, but must always include an ethical factor as well. To benefit from and enjoy any sport, one has to accept the risks, incidents and accidents which may go with it. That is the rule, the moral contract common to all sports, and indeed life itself, although gymnastics is well down the list of sport statically classified as dangerous by insurers. Young gymnasts are not always fully aware of the risks involved, although they are the ones who take them. Coaches, parents, organizers and doctors must always remember that the moral responsibility they bear is considerable, since it is, in fact, delegated.

The physical, physiological, psychological and ethical limits must be based on accurate, ongoing assessment of the individual's capacities, measured against the demands and constraints of the activity, always remembering that the organism involved is in full process of development and therefore vulnerable. These are questions for the doctor, the coach and indeed the psychologist, who must all work together in pursuing just one aim, the child's self-fulfillment. One must guard against the unhealthy complicities which can develop in this area, where doctors are sometimes exploited as hostage, pretext or rubber stamp, and unduly influenced by coaches, or where, even more dangerously, coaches regard themselves as medically competent and act accordingly.

Respect for the child's specific physiology is the necessary basis of all action. Children have

natural abilities which they can and must be allowed, and indeed encouraged, to use. But they are also naturally incapable, physically and biologically, of meeting certain demands. There are many examples, but one will suffice: the level of myoglobin, an oxygen-carrier which fuels the muscle fibers, is highest in the muscles at the end of puberty. Work which relies on pure strength is thus incompatible with the subject's physiology and so all but impossible. Exercises to develop speed and agility would be more appropriate. This example shows the need for a good knowledge of the physiology of growth, and many others could be cited. There are some things that a child's physiology and psychology will not let him or her do yet. This should be accepted.

In the case of osteo-articular pathology, there are two types of risk. The first is of accident-caused injuries, such as sprains, dislocations and fractures, which may have serious and lasting effects, especially if they are neglected and if recovery, healing and rehabilitation periods are not respected. This is true of fractures affecting mainly the fertile zone, growth cartilage. In certain conditions, the consequences of resuming training too soon and too intensively can be disastrous (i.e., shortening of a limb by angulation of the bone caused by growth deficiency).

The second risk is chronic pathologies: these include so-called fatigue fractures (or fissures) affecting legs, feet, hands and vertebrae. Properly treated, wounds can heal and bones knit with no after-effects. These fractures are sometimes discovered by chance and are probably, but not always, due to excessive training (isthmic lysis). Other causal factors include certain diet deficiencies, decalcification and often a reduction in bone density. These deficiencies must be corrected as quickly as possible, since they may contribute to or aggravate osteoporosis in the very long term.

The growth-related articular diseases, such as osteochondrosis, can affect all the joints. Statistically, they affect young people engaged in high-level sport slightly more often than those who go in for leisure sport or are sedentary.

There is, however, one fundamental difference: they must be watched far more closely in the case of young high-level athletes, since the accumulation of pressure-stretching-rotation phases and of various micro-traumatisms can lead to complications, and especially permanent after-effects, if they are not treated by a doctor and/or the coach fails to obey the doctor's instructions. Coaches would be wise to adjust training to reduce pressure on the affected joint, or even interrupt it for a short or longer period, as advised by the doctor. If these rules are followed, these conditions should right themselves spontaneously in 80% of cases. We have painted a less optimistic picture of osteo-articular pathologies than we did of hormonal disturbances: the catching-up process does not apply here, but after-effects can be avoided almost invariably if coach and doctor work well as a team.

Because they are often less spectacular, less visible, more insidious and longer lasting, psychological disorders can be very dangerous, interfering with the child's gymnastics career and leaving permanent scars in later life. Here again, prevention depends on common sense and on the sense of responsibility both of parents, who too often try to fulfil themselves through their children's exploits, and of coaches, who are too often in a hurry to "manufacture" champions. Parents, coaches and federations must take care that gymnastics does not become the child's sole center of interest, avoiding both saturation (a gymnast's career starts early and is a very long one) and dependence either on gymnastics itself or on the coach. The danger with coaches is that children may develop a fixation on them, expecting to be told all the time what to think and what to do. All too often, the

gymnast/coach relationship, especially in women's gymnastics, is one of subjection/domination. Child athletes must not be robots in their coaches' hands, but must have as much freedom of expression as other children of their age, so that their personalities can develop fully; their performance will be all the better for it.

Everything we have said so far points to the coach as the key person; constantly present, he/she sometimes becomes the gymnast's first "family." Overall, and depending on his/her qualities or shortcomings, the coach is one of those most responsible for all successes or failures. From a technical, physical, psychological, ethical and social point of view, the golden rule is to treat children or adolescents as such and employ methods which are specially designed for them, and not just derived from those used with adults. A child is not a miniature adult, for whom training programs are simply scaled down. A child is not a smaller, weaker adult, but a special being who requires special treatment. The coach must be willing to adapt the program constantly to the child's capacities at any given moment, and even suspend or abandon it completely if there is the slightest risk or doubt. He/she must ensure that every exercise and movement is carried out below the pain threshold: pain is a useful warning signal that danger lies ahead (some painful stretching movements too often result in damage to tendons and bones). Take your time. This is the key, even when you have commitments or want to prove yourself quickly. Lasting results are never achieved overnight; real champions mature slowly—hence the importance of a long-term career plan, covering training, rest, general education, leisure and competition phases.

We must endeavour to protect childhood, that wonderful period of human life which child athletes need to experience fully to "build up memories," like other children of the same age. If children are artificially turned into adults too soon, a whole period of waking to the world, maturing psychologically and gathering experience, which is vital to future stability, is simply wiped out. Children and adolescents must not be cosseted or indeed idolized because they are champions, but they must be shielded from the stresses, constraints and problems of adulthood for as long as possible. This is difficult, since there is a discrepancy between the child's psychology, aspirations and needs and the demands made on him/her in an environment (competitions, media, travel, etc.) largely created by and for adults. In short, parents, coaches, the media and organizers should let children and adolescents be just that—and not use them as a means to personal glory or power.

The Rules on Admission to Competitions

The FIG rules make the minimum age for admission to its competitions 16 for male and female seniors and 15 for competitive rhythmic gymnasts, 14-18 for male juniors and 13-15 for female juniors, and 12-14 for competitive rhythmic.

For information, here are the average ages recorded at:

<i>The 1995 World Championships in Sabae</i>	Men	22.73 years
	Women	16.57 years
<i>The 1997 World Championships in Lausanne</i>	Men	22.81 years
	Women	17.43 years

These figures are illuminating and provide the answer to media allegations that female top-performers are being allowed to enter our competitions at an ever-earlier age. The figures

show the contrary. These age rules are needed, of course, even if they naturally take account only of chronological age in grouping competitors in categories. As we have seen, this is far from being fair in an international context, because of the wide variations in maturing from one country to another. Nevertheless, the rules do have the advantage of respecting average norms in a majority of the Federation's member countries. Perhaps some continental unions or groups could adapt them to their real situations, i.e. to early or later maturing, for their own competitions.

Junior competitions raise a real problem, and a simple age limit is not enough to separate them clearly from the spirit and the physical and technical difficulties of adult competitions, which is the aim in all forms of sport. This age limit remains totally artificial if no qualitative or quantitative limits are imposed on the level of involvement. We know that juniors are perfectly free to train with the aim of presenting a program far superior to, "riskier" than, the one presented by any senior champion in the previous competition. And so everything depends on the coach's sense of ethics and responsibility. Junior competitions are fine as long as precise limits are imposed. There is no question of returning to rigid, compulsory exercises, which are tedious and lacking in media appeal, but it should be possible to come up with a program in which the difficulties are controlled and adapted to the age of the competitors, leaving them free to link and choreograph the different elements, and paying more attention to the technical quality of the performance—in short, to adopt a new philosophy.

The quality of the equipment used is vital, in terms both of basic design, which can help to reduce the accumulation of micro-traumatisms, and of the safety and protective features which can be added. Teaching aids should be used throughout the learning period. It would also be a good thing if the excellent laboratories which test and approve our equipment spent far more time on tests carried out directly on gymnasts (measuring the physical stresses on joints, muscles and tendons). It would seem more important to monitor gymnasts and the stress to which their muscles and joints are subjected when using the equipment, than simply to monitor the equipment and mats when subjected to the gymnast's weight, and to verify the qualities involved in carrying out the exercise and completing it as perfectly as possible. Although both types of research are useful and complementary, one must never forget that a young gymnast's joints and cartilage are being built up and are therefore fragile, and must be protected all the time against shocks and their accumulated effect.

Time Management & Healthy Lifestyle

Time-use must ensure a healthy balance between family, school, leisure, relaxation and gymnastics. Managing these timetable elements harmoniously and wisely is not easy, but it makes for success; the slightest imbalance, too much emphasis on one area, and particularly a real obsession with training, rocks the boat dangerously. Many federations have set up special sport/study-type programs for young elite gymnasts, cutting out time-loss on things like travel from school to training center, and devoting considerable time to school work. The ideal situation is one where family, leisure and rest factors are respected too. Leisure activities should include other sports, games and activities which are suited to children and adolescents and which they enjoy. Families have a vital part to play. Ideally, they should be close at hand, in regular contact or represented, if necessary, by a host family at the place of training—but they should not be omnipresent and should not be allowed to interfere overmuch, as they sometimes do, in technical areas of which they know nothing. With very few exceptions, parent-trainers cause serious problems and pose a real threat to the child's equilibrium; "projection" is carried to extremes in such cases and is very harmful to the

child.

Everyone's role must be clearly defined: parents are there to bring their children up, trainers to train them, and doctors to provide medical supervision, screening and treatment. A healthy lifestyle is mainly a matter of managing everyday life outside the gymnasium. These cover things like stress-control, sleep, problems linked with travel, time differences, climate variations, etc. and, above all, diet.

Diet is a vital question for young athletes, and getting it right in practice is not always easy for a whole variety of reasons: children are torn between their natural liking for (mainly) sweet things and the restrictions imposed by their sport and trainer. Reasonable diet control, essentially based on physiological principles, should be relied on to reduce episodic bulimia and real excess weight, which is unsightly, a handicap and even potentially dangerous, particularly when doing acrobatics. A serious effort must be made to stamp out unacceptable aberrations, based on unfounded, unrealistic, physiologically unsound, highly dangerous and always restrictive principles, which result in extremely serious deficiencies (in water, minerals, vitamins, glucides, protides and lipids). They interfere with growth, somatic development and the normal hormonal processes and can lead to anorexia nervosa, a psychosomatic pathology which is hard to control and sometimes fatal. This terrible illness has nothing whatsoever to do with gymnastics; it turns up wherever the physiological diet rules and processes are ignored, and specific psychosomatic conditions apply. On the contrary, sport and gymnastics can, under reasonable and qualified supervision, be an excellent means of prevention and therapy. Our own code makes it our duty to protect gymnasts against such deprivations and deficiencies, which are hardly compatible with high-level sport and may even be dangerous.

Diet, vitamin and mineral supplements are sometimes necessary. They must be kept at a low level and be justified by deficiency risks which food alone cannot wholly overcome (iron deficiency in particular). Here, too, aberrations are possible, and doping—or practices which are not called doping to start with, but soon adopt its philosophy and principles—may become a temptation; apart from being deplorable in terms of sports ethics and education, the dangers of using certain doping substances are multiplied when young people are concerned.

Even more serious is the use of hormone products to slow down or accelerate the growth processes for purposes of sport only. This is a criminal offense and a matter for the courts, even if we ourselves have an important part to play in the area of prevention and in providing information.

Another vital point is the need for rest periods and plenty of sleep. Children need far more sleep than adults; this must be taken into account not only in daily life, by avoiding late training sessions, but also by avoiding early morning qualifying sessions and evening competitions.

Medical Supervision

This involves monitoring the various factors which contribute to the child's equilibrium and make for balanced practice of the sport, and detecting any sign of excessive training or effort as early as possible. Such monitoring is necessary and compulsory, and indeed the basic condition for children's involvement in sport. It must be stringent when children are

embarking on high-level training programs or, even better, at the preparatory stage, when they are being recruited and selected for such training. After that, they must be monitored very regularly throughout their sporting career. As far as medical confidentiality allows, practical information gleaned from every check-up should at once be passed on to coaches.

Because some of the qualities needed by gymnasts can be acquired at a very early age, and because professional, social/affective and leisure demands soon make themselves felt, leaving them with little time or inclination for inevitably long and sometimes tedious training sessions, gymnastics, or at least its artistic, rhythmic and aerobic disciplines, attract young people even at a high level.

Although gymnastics is often singled out and accused of encouraging maturing disorders, it has no special characteristics in this area, as compared with other sports. Like them, too, it generally has a very favorable effect on development in the long term. But so many precautions, warnings and restrictions are needed! There is no room for improvisation when young people are engaging intensively in gymnastics. The responsibility must be shared between structures and people who combine common sense, specialized training and an impeccable moral and ethical sense, even if the coach remains the one person on whom the child's sporting, and indeed general, future, depends to a very large extent. Coaches' skills and their respect for the special people they are training are factors in success. Their own proper training is the basis of every development program run by any national or international federation which has a real sense of its responsibilities.

The coach is the main person in the process, but not the only one. One can think of the gymnast's vital balance as being sustained on a kind of three-legged stool. Each of the three legs complements and supports the other two, and all are equally strong. I am thinking of the doctor, coach and parents, each bearing part of the weight and all providing general support.

In some civilizations, children are sacred. And the moral and physical welfare of children who engage in sport should be sacred to us. If we stay vigilant, stop the few unscrupulous sorcerer's apprentices from getting away with their malpractices, and respect the basic rules of physiology and ethics, our children and adolescents will—if they prove to have the right abilities—be "winners" in terms both of sport and of health, and make the most of their youth in the process. There is no basic incompatibility between the two.

And if our gymnasts lack the necessary skills, if there is the slightest risk to their health, then they must be able, without any sense of having failed, to switch to a more suitable level of activity, or a different activity altogether.

All forms of sporting activity are worthy of respect.

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