Anabolic substances and their use in sport

By D[r] Jacques Pellizza

For over ten years now, every time a record was beaten in a throwing or weightlifting event, the question of anabolic substances was bound to be raised. But anabolic steroids, real muscle builders, or "fertilisers" as they have been called, infest the field of light athletics just as much as heavy. Evading all analyses, all checks and tests (see the booklet Doping *published by the Medical Commission of the IOC, presided over by the Prince of Mérode), they have become products of current use in many physical activities quite outside the sphere of sports events based mainly on sheer strength.*
D[r] Jacques Pellizza, a former French international athlete born at Pau on 29th October 1942 (Bronze medal for the javelin at the Abidjan Games of Friendship in 1961), recently presented a thesis on the subject—sponsored by Professors Paul Berthaux and Plas—to the Faculty of Medicine in Paris. He is the son of Henri Pellizza, who was for a long time one of France's best tennis players and is at present general commissioner of the Racing Club de France.
We feel it necessary to add this contribution to the problem of doping by publishing the most important passages from this thesis, especially now that international sports officials are devoting particular attention to it.
D[r] Jacques Pellizza has received the 1st Price of Sport Medicine, allowed by the Academy of Sport Medicine the 22nd February.

. . . Nowadays competitive athletes are properly trained for performing great sporting achievements. However, some seek to do even better by calling on medical and pharmaceutical means for assistance—whether warranted or not—ranging from the simple taking of vitamins in normal doses during periods of fatigue to the use, or rather misuse, of amphetamine-based doping substances.

The latter are now subject to very strict laws governing their use in sports circles. But while a great deal has been said about doping, which has had certain tragic consequences in cycle racing and athletics, very little has been said as yet regarding the part played by anabolic substances, which certain foreign athletes have been using for some time now.

These products, used daily in medical therapy under proper supervision for very definite indications are also used by a number of athletes such as weightlifters, shotputters, discus, hammer and javelin throwers as well as boxers and wrestlers... The following lines will be devoted to a

study of these anabolic substances and their use in sports circles.

Historical

Since time immemorial, men have tried to develop their muscles with a view to increasing their strength and, for this purpose, even in the 6th century B.C., as Milo of Croton tells us "Athletes tried to increase their physical powers by eating meat that differed in quality depending on the event for which they were training.

"Thus, the meat of bulls was much prized by shotputters and boxers, while fat pork was reserved for the heavyweight wrestlers. As for the jumpers, they favoured goat's meat."[1]

Down through the centuries, meat-eating continued to be held in high esteem by athletes as a source of strength and stamina, in particular by the wrestlers and strong men of the Breton and Basque games.

Since the beginning of the century, it has been well known that in order to gain weight, shotputters, discus and javelin throwers, weightlifters and body-builders consumed whole quantities of dietetic products, in some cases even going so far as to "feed" their muscles by rubbing in creams of varying degrees of efficacity in order to increase their biceps or thigh measurements.

"In 1955, Paul Anderson was the 'strongest man in the world'. His total for the three Olympic lifts in weightlifting was fabulous for the day: 533 kg (today's world champion out-lifts Anderson by over 100 kg). His measurements were impressive too. He weighed 152,500 kg for a height of 1.68 m with a biceps

[1] Quoted by Pierre Dumas, *Vie médicale,* Special No. devoted to sport, June 1968, France.

measurement of 51 cm and a thigh measurement of 87 cm.
"This extraordinary athlete drank five litres (over one gallon) of milk a day but, on the other hand, ate comparatively little."[2]
Since then we have seen aspiring champions go in for muscle-building sessions with a quart of milk at hand, attributing almost magical virtues to this beverage!
During the last few years however, what was once merely a subject for anecdotes has become a science, and many countries have carried out exhaustive tests on products capable of enabling determined athletes to gain weight or build up their muscles with a view to improving their performances.
As Alberto Arcioni emphasizes, "Russian athletes very probably used anabolic substances prior to 1960, but it was in that year that we received the first certain information of their use. At the same time, in the USA, Ziegler was using these substances on weightlifters in Pennsylvania."[3]
But, before going any further and without taking sides for or against any particular method, we must join very many other authors in stressing the dangers inherent in the use of anabolic substances, these dangers being considerably increased by the ignorance—as a general rule—of those who take them, regarding their harmful side-effects and by the blameworthy behaviour of others who, under cover of medical supervision, falsely tranquillize athletes as to possible side-effects.
At present, there are very few doctors, anywhere in the world, capable of successfully carrying out a hormone treatment applied to the field of sport and, what is more, how many are there capable of predicting the individual reactions of each athlete to such treatment?

[2] Periodical *Sport et Vie,* No. 2, July 1956, France.
[3] *Athletica,* No. 3, March 1971, "For or against anabolic substances?," Italy.

Definitions—General

For Garnier and Delamare, anabolism consists in the conversion of nutritive materials into living tissue inside the human organism.[4]
An anabolic substance favours this phenomenon by simplifying the absorption of elements necessary for cellular life, in particular amino-acids, at the level of the cells of the muscular fibre.
It is this effect that has led to these substances being called—somewhat over-simply—real muscle "fertilizers".
In other words, anabolic substances produce an increase in weight by positive action on the muscular mass.
Hormonal steroids related to testosterone or even androgenoproteinic hormones have a very marked anabolic effect and originally were used for this property for therapeutic purposes...
...Let us consider first of all the study of the androgenoproteinic hormones, since these are the ones used almost exclusively by athletes up till now.
Androgenoproteinic hormones are a group of substances secreted partly by the testicle (1/3rd) and partly by the cortex of the suprarenal gland (2/3rds), which possess an androgenic action and are capable of stimulating the proteinic anabolism. This group comprises mainly:

– Androsterone
– Actiocholanone
– Isoandrosterone
– Dehydroisoandrosterone
– Androstene
– Androstadiene...

[4] Garnier and Delamare, *Dictionary of Medical Terms,* France.

... Among the known androgenic steroids secreted by the testicles, the ovary and the suprarenal cortex, three especially are important from the quantitative point of view:

– Testosterone
– Androstenedione
– Dehydroepiandrosterone.

Released into the main circulation, these steroids perfuse the "target organs" on which they sometimes exert their biological activity, before reaching the liver...

Physiological action of the androgens

This takes the form first of all of morphological effects on the primary and secondary sexual characteristics, and second, of metabolic effects; the various actions seem to be triggered off by the increased synthesis of proteins at cellular level.

Morphological effects

Primary sexual characteristics

At the level of the male genital system, the absorption of androgens leads in theory to an increase in the size of the testicle and in the formation of spermatozoids. In actual fact, there is an indirect effect cancelling out this mechanism and even reversing it, leading in the end to an atrophy of the testicles and a decrease in spermatogenesis and in the function of Leydig's cells...
... This complex and fragile mechanism can be completely disturbed when there is any additional outside contribution of male hormones (in other words when an athlete takes anabolic hormones). What happens then under these circumstances? The androgen content of the blood is artificially increased. The regulating centre is "misled" and reacts by causing a decrease in gonadotrophins, which results in the testicle being set to rest with a consequent drop in spermatogenesis and an atrophy of the interstitial tissue leading in its turn to a wasting away of the testicle which then becomes incapable of producing spermatozoids or hormones...

Usual indications for Hormonal anabolic substances

... What on the whole are the indications justifying the use of androgenic steroids in therapy?
In the first place, the powerful anabolic effect is sought after in cachectic states: mal-nutrition, anorexia, loss of weight due to cancers, chronic diseases, proteinic catabolism, long-term corticotherapy.

To a lesser extent, states of depression, asthenia in all its forms but particularly in old people, overwork, and andropause symptoms are favourably affected by these substances and by their psychotonic, or mood-elevating, effect.
The effect of fixing the calcium of the bones is used in the after-effects of fractures (especially in older patients), in pseudoarthroses and in cases of delayed consolidation, in all decalcification phenomena, in particular osteoporosis...

Non-hormonal anabolic substances

They have a chemical structure completely different from the above and are completely unrelated to them. Furthermore, they produce none of their side-effects (nevertheless certain reservations need to be made here).
Dibencozide is the fundamental molecule of the two main products of this class used at present...
... The indications for these non-hormonal anabolic substances are mainly protidic disorders, states of asthenia, anorexia...

... The laboratories producing these new substances stress the fact that there are no contra-indications to the use of these molecules. In actual fact, the major disadvantages produced by the androgenic steroids do not exist. The virilizing effects are nil. There is no hormonal interference, no mechanism of inhibition of the gonadotrophins.
However the myotrophic effect and the gaining of weight can sometimes have a harmful effect on athletes, as we shall see in the next chapter...

Use of anabolic substances in sport

Anabolic substances started to be used in sports circles about the year 1960. At this date, only the androgenic steroids were known.
They were used first of all in events where pure strength had to be developed (shot-putting, discus, hammer and javelin throwing, weightlifting).
Today these substances are used much more widely and, for this reason, we distinguish two quite distinct non-restrictive categories:

1. *Sports requiring an overall increase in strength*

Weightlifting
Athletics: Throwing events
Shot
Discus
Hammer
Javelin
Decathlon and pole-vaulting
Boxing
Wrestling
(in the "heavy" categories)
Judo
Ice hockey
American football
Body-building (it should be pointed out however that those going in for this are aiming much more at building their muscles for show than at increasing their strength).

2. *Sports requiring the strengthening of one or more groups of muscles*

Athletics: Sprints (100 and 200 m)
Jumping (high, long, triple)
110 m hurdles
To a lesser extent: 400 m, 400 m hurdles, 800 m
Cycling
Rowing
Skating

Very probably other sports like rugby (the forwards), skiing, gymnastics and even swimming have been the object of similar experiments.
These observations call for certain remarks:

Athletes belonging to the first category (with the exception perhaps of the body-builders) have to submit their bodies to intensive efforts while developing their muscles through the action of the anabolic substance, otherwise their strength will increase but little...
... In all dynamic physical exercise there is an element of speed, and therefore the higher the weight, the greater the muscle power required to ensure that the speed does not suffer. In other words, the muscular efficiency will have to increase with the myotrophic effect, in spite of an increase in the weight of the muscle, which partly offsets this action...
... As for athletes coming under the second category, in addition to taking anabolic substances they must also perform specific work aimed at strengthening one or several groups of muscles. Thus sprinters

practise the weightlifter's squats as well as jumping up and down with heavily laden bars on their shoulders in order to increase the strength of their legs and thighs. Exercises are also done for strengthening the lumbar, gluteal and abdominal muscles...

Study of anabolic substances in sports circles

Main studies carried out on androgenic steroids and their application in sports circles

... A significant study of the use of anabolic steroids is that of Johnson and O'Shea published in the magazine *Science*: 24 subjects kept on a diet with a high protein content and practising weightlifting for six weeks were examined. At the end of the third week, twelve subjects were given 5 mg of Dianabol per day, twelve subjects received nothing. Records were kept for all, concerning weight and strength, as well as a number of anthropometric and serological This study enabled the authors to conclude that the injection of Dianabol had the effect of definitely, even if not excessively, increasing weight and muscular strength.
However the same authors concluded that very little is known concerning the collateral effects of anabolic substances on adults and that in the case of individuals not yet fully formed physically (youths under 20 years of age), the consequences may be dangerous for the genital organs and the skeleton.
Another interesting study is the one carried out by West Germany's former long jump champion, Steinbach of Mainz University:
– 125 young athletes were placed under observation for a period of three months with a check kept on their weight and the increase in their muscular strength; during this period some were given a daily dose of 10 mg of Dianabol, while others received only a placebo instead of the anabolic substance, with or without simultaneous training. The results showed a minimum increase in muscular strength in those taking Dianabol and training at the same time; the same author reports the possibility of side-effects caused by prolonged treatment...
... The Swiss Weiss and Muller *(Revue de Médecine sportive suisse)* have also carried out studies on a certain number of subjects receiving 10 mg of Dianabol per day and another group receiving only placebos. In this experiment too, the difference between the two groups examined was only negligible, which, in the authors' opinion, must be considered as a mere matter of chance.
Kereszki administered an androgenic steroid to a group of tired athletes for a period of three weeks and noted a return to their previous efficiency. As a result of these studies Arcioni thinks that substances like this with anabolic effects prove effective when the athlete's organism shows loss of weight and a negative nitrogen balance...
... Arkadi Vorobiev, five times world champion, ex-trainer of the Soviet weightlifting team, "agrégé" of medicine, head of the Department of Scientific Research and Instruction, and a member of the Committee for Physical Education and Sport of the Council of Ministers of the USSR, expressed his opinion on androgenic proteins in a famous French daily (*Le Monde,* 3rd July 1970). This trainer-cum-doctor pointed out that the increase in weight, the artificial "inflation" so to speak of a weightlifter's body exerts no decisive role in his athletic preparation. Being over-

weight can in fact have a negative effect on his locomotor activity and, consequently, on his performances.
There is a clearcut biological law: as the weight of the body increases, the locomotor powers decrease. All living beings expend part of their energy in overcoming the force of gravity, and the heavier the weight of their body, the more energy they expend. In this connection, Vorobiev quotes Soukhanov's formula (1968):

Lc=relative force, i.e.:

$$N=\frac{Lc+3}{3(0{,}45.\frac{G}{60})}$$

$$\frac{900}{\frac{\text{results of the three lifts}}{\text{weight}}}$$

G=weight of the weightlifter

This formula enables us to calculate the approximate expenditure of muscular force needed to overcome gravity in terms of the weight of the body.
Vorobiev carries out an analysis of the world records where the N of Soukhanov's formula represents what he calls an "index of mastery" and he goes on to prove that this index is higher in the bantamweight weightlifter Kourentsov (75 kg) than in the super-heavyweight parameters.
Zhabotinsky (163 kg—see table below). Therefore, in the opinion of the ex-trainer of the Russian team, anabolic substances, which increase the muscular mass of the athlete do not—and precisely because of this fact—help to raise the level of the weightlifter's performances. He asserts, moreover, that anabolic substances are not used in the athletic preparation of Russian champions... The "secret" of their success lies in rational training and in a scientific observation of the recovery of the organism after effort.
The method of training is described as an alternation of intense effort (catabolic phase) and prolonged rest (anabolic phase), the first stage stimulating the second.
For Vorobiev, the supply of amino-acids, vitamins, mineral substances and microelements is vital and he concludes by calling attention to the efforts made with regard to general physical and psychological preparation as well as to the tailoring of training to each individual's requirements.

Vorobiev's Table

Weight of athlete G	Results in the three lifts	Relative force Lc	Index of mastery N
56	367.5	6.56	7.01
60	397.5	6.62	7.13
67.5	440	6.52	7.18
75	482.5	6.43	7.25
82.5	487.5	5.91	6.99
90	522.5	5.80	7.04
163	590	3.62	6.58

Among the studies we have had an opportunity of examining, we were particularly struck by that of Fowler. Gardner and Egstrom of the University of Los Angeles.

The performances and certain biological parameters of 47 adults were recorded over a period of sixteen weeks:

– 8 were given placebos.
– 9 were given 1 methyl[1] androstenolone acetate (Nibal) 20 mg daily.
– 15 were given placebos and made to follow a course of strengthening exercises at the same time.

These 47 subjects were all men in good health, between 18 and 25 years old.
Ten played American football, while the others trained regularly in their colleges...

... Results

Many parameters remained unchanged throughout the course of this study. Their height, thigh circumference, panniculus adiposus, and suppleness, for example, did not vary.
As for the serous enzyme content, the changes occurring in the 16 week period were not significant for any of them. The variations in weight and vital capacity were hardly any more conclusive. Finally, with regard to physical performances, the only improvements noted were among those belonging to the groups doing 30 minutes training every day, but there was no noticeable difference between those who had received the placebo or the anabolic substance at the same time.

Discussion

On the whole, in the study under consideration, the androgenic steroid tried out on its own did not lead to any appreciable improvement in performance or in work capacity. From this it may be concluded that under the conditions of the experiment, the hormonal anabolic substance did not increase the strength of the athletes tested, so that its use by athletes is in no way justified...
... The conclusions of Fowler, Gardner and Egstrom differ from those of Johnson and O'Shea.
The latter, at the end of their study, came to the conclusion in fact that anabolic steroids can accelerate the acquisition of a certain muscular force and at the same time allow the athlete to train to the maximum, or almost, of his possibilities with the greatest intensity desirable...

Conclusions to be drawn

From these different, often discordant studies, a number of conclusions may be drawn.

The anabolic steroid seems to possess a certain myotrophic power helping to increase strength, provided that certain vital factors are respected, i.e.:

– a sufficient supply of calories;
– an extra supply of proteins;
– the absolute necessity of accompanying treatment with intense physical effort.

On the other hand, it would seem that the effectiveness of a hormonal anabolic substance is definitely more marked on an organism suffering from a nitrogen calory deficiency and we wish to stress this point for we consider it of the utmost importance. Hettinger has already put forward the hypothesis of a relationship between the action of a steroid and the low urinary elimination of 17 keto-steroids. Arcioni, as a result of Kerenski's work, thinks that these products have their maximum effect when the athlete's organism is in a state of deficiency; one has only to remember the spectacular effects of these steroids in cases of cachexia—in advanced cancers for example.
But in the healthy subject, the need being less or nil, the effect will be little or nil unless, as a result of a series of imbalances of the type

1. Intensive training $\rightarrow$ resulting slight loss of weight, slight deficiency of the organism $\rightarrow$ Taking of hormonal anabolic substance (+proteins)
2. Intensive training, etc.

The athlete happens to create "artificially" the same needs as a subject showing loss of weight caused by some disorder, in this way achieving the "stimulation of an anabolic phase, by a catabolic phase" as Vorobiev defined it earlier on.
This is only a hypothesis, which might account for the small effect of a product

like Dianabol—which is normally very powerful—when it is used alone, without any accompanying exercise.
For this reason it is completely illogical for certain sportsmen to consume tremendous quantities of pills or to receive repeated injections of anabolic substances since beyond a certain level (which some try to push further back than others by more intense training) the capacity for "building" muscles will be exceeded and the illusory excess of weight obtained will in fact be nothing more than the consequence of sodium-hydro retention due to a secondary effect of the product.
It would seem therefore that the limits of the effectiveness of an anabolic steroid lie not so much in the dose at which it is administered, but that they are rather bound up with the training targets, or limits, a sportsman may successfully set himself, and we know that these limits are pushed further back every day.
Finally, practically no author has stressed the dangers inherent in the use of such substances.
One may moreover be sceptical concerning the expression "studies carried out under medical supervision"...
Similarly, it would be disastrous for certain medical teams to sanction the use of hormonal anabolic substances by athletes under the pretext that they are issued in normal doses and under their responsibility.
What kind of check will there be in a few years time when one risks diagnosing the rupture of a tendon or worse a tumour of the prostate?
None of the experiments carried out on androgenic steroids mention any examination of the prostate (questioning, rectal feeling, measurement of phosphatases...) and yet this is a matter of vital importance...

Non-hormonal anabolic substances

The oral forms of non-hormonal anabolic substances have been known for several years now. Recently, injectable forms of this type have been made available to doctors.
Their advantage in therapy consists in the absence of toxicity and contra-indications. It is very useful for example to be able to administer anabolic substances to babies without any fear of more or less serious side-effects. Harmful androgenic effects, in particular the stopping of growth or the production of tumours on the prostate need never be feared...
... On the healthy individual, a study has been made in sports circles by Chailley-Bert and coll. The experiment was carried out on 54 students at the IREPS in Paris. A proper diet was worked out and given to each subject as well as a sufficient supply of proteins. Dibencozide was used in doses of 3 capsules per day for about 4 weeks and clinical examinations of the subjects were carried out at rest and after each exercise. Laboratory tests were made, in particular measurements of the urea in the blood and the urine, of the glycemia and total lipids. The hematocrit, the blood count, the prothrombin and hemoglobin content were all recorded.
These tests showed that tolerance of the product is good and that the product has an overall invigorating effect with improvement of physical fitness. Sleep is not affected; a better adaptation to effort with good recovery is also noted. The average gain in weight is about 2lb and the appetite is increased. With regard to the pulse-rate, there would seem to be a slight acceleration of the pulse at rest but a drop in pulse-rate during effort, with an in-

crease in the differential A.T. after treatment.
In Chailley-Bert's opinion, a dose of 3 capsules a day (9 mg) seems particularly favourable and the trophic effect of the dibencozide on the muscles is good.

The risks

Apart from the troubles referred to in the previous chapter, the athlete who uses—and frequently misuses—anabolic substances is liable to terrible after-effects.
In particular, there is the danger of accidents to tendons, from the simple prolonged and recurrent tendinitis (especially in the knees) to complete ruptures of the tendons (brachial biceps and triceps, quadriceps, and sural triceps to mention but the main muscles involved).
This type of accident can be explained as follows: under the effect of the anabolic substance, the muscle hypertrophies. Consequently the tendinous "attachments" do not develop. In any violent muscular contraction, this attachment is submitted to a stronger traction than normal. Very roughly speaking, the bigger the muscle, the greater the risk of rupture during a short, intense effort.
In addition, we have seen that the "strong-man" type of athlete undergoes intensive training for his muscles, the joints—in particular those of the lower limbs—being placed under tremendous strain, during the series of squats (movement of alternate flexion and stretching of the legs with heavily loaded weightlifting bar on the shoulders).
Many cases of evolutive coxarthrosis and gonarthrosis have been noted in this corpulent type of athlete carrying out these repeated exercises...
... To close, let us also point out that a male athlete using anabolic substances always runs the major risk of causing a prostatic tumour due partly to the dose and partly to individual susceptibility. This last factor is impossible to predict and so-called "medical" supervision is unable as yet to detect it...

Sportsmen and anabolic substances

The motivations

For what reasons does a sportsman take anabolic substances?
For greater convenience we shall consider the case of shotputters, discus, hammer and javelin throwers, weightlifters and body-builders, who are among the main consumers of these substances.
We know that in normal doses and used wisely these products can have a by no means negligible myotrophic effect on a healthy individual, with a consequent increase in strength.
Whether he gets his supplies from the chemist's or whether he goes to a doctor, the athlete concerned knows practically nothing of the product chosen except that at the end of his treatment (and he is often totally ignorant of the actual details of use), his performances should be considerably improved.
Certain champions think that anabolic substances are the equivalent of a highly perfected dietetic product capable of making up for the lack of a food properly adapted to the considerable efforts involved in highly concentrated muscular training (Castang ENSEP, Paris). Others like Drufin have followed several courses of treatment because all the other shotputters did the same (during a period of training in the USA a few years ago).
Another shotputter, Beer has said as follows:
"Nowadays all the really big shotputters take anabolic substances. The alternatives are as follows: either one takes them and

one is competitive, or one doesn't and one ceases to be in the running... No one is going to say 'I have given up taking anabolic substances, I hope the others will follow my example'. Everyone wants to be absolutely sure that he is competing on equal terms with everyone else."

The course of treatment

The effect of an anabolic substance on an individual is not immediate. Unlike doping substances like amphetamines, their short-term action is not spectacular and a certain time of latency is needed before the effect becomes evident in a gain in weight...

...The taking of anabolic substances 48 hours before a competition, even in very high doses is completely ineffective, and many ill-informed sportsmen have committed this error in the past. In such cases, if good performances have nevertheless been made, they are to be attributed entirely to the profound psychological effect created by the absorption of these substances. In actual fact, in most cases, the instructions laid down for a standard course of treatment are not respected, "everyone wishing to go one better than the next..."

And then we come to the inevitable abuse or misuse, first of all as regards the dose recommended and second as regards the length of treatment. Willy Holland, trainer of the British weightlifting team has categorically stated: "I have heard it said that certain competitors administered intravenously thirty times the dose recommended in hospitals for cases of rickets!" Assertions of this kind are alarming and need confirming.

The shotputter Beer mentions a course of treatment lasting 13 days, at the end of which his weight had risen from 110 to 114 kg. In the same period of time, his weightlifting performances had all improved and he beat his own personal record. To quote his own words, he experienced an "extraordinary need for action and he felt a tremendous appetite". Harold Connolly, Olympic hammer champion in 1956, also followed a course of treatment with 20 mg of Dianabol per day for three months. His weight rose from 104 to 114 kg. He too improved his personal records.

For our part, we know certain athletes who swallow as many as ten Dianabol pills a day, a fortnight before the competitions. The unfortunate part of all this is that, far from causing any alarm, this practice tends to arouse an astonished, even admiring amusement on the part of certain strong men, as if it were a feat in itself in the same way as the achievement of a performance of real value.

... We would like to add a few words on the financial side of the practice, showing just how expensive the constitution of a veritable panoply of medical and dietetic products can be—in fact far too heavy a burden for a modest budget to bear...

... Obviously the bill very seldom has to be footed by the athlete himself...

Taken as a whole, vitamins, dietetic products and anabolic substances, not to mention the tremendous quantities of meat consumed, add up to some $100 to $200 a month for those who use them.

The same is approximately true of a course of treatment with non-hormonal anabolic substances. The only difference being perhaps that the treatment needs to be a little longer than with steroids in order to produce the same results...

... We have made out a table showing the improvement (in per cent) of the world records in a number of men's events.

We have divided our statistics into three sections, each corresponding to eleven years of competition.

1936–1947
1948–1959
1960–1971

It was at the beginning of the last period that American supremacy in putting the shot and other throwing events became unparalleled. Three "ceilings" were topped: the 20 m mark in the shot, the 60 m for the discus, and the 70 m for the hammer.

It was about this same time too that anabolic substances began to be used in Russian sports circles.

In the table below we see that the progress in the throwing events is far more marked than that in jumping and running (see graph.). We have considered only three types of throwing event and three types of jumping for the figures for our graph., voluntarily excluding the javelin and polevaulting where the evolution of the equipment falsifies the calculations.

We have not made any precise evaluation but the result is even more striking when one considers no longer the evolution of the records alone but that of the twenty best world performances for each period. Today, the levelling out of international values at the top after the clear domination of the Americans during the 60's... can be accounted for by many factors (training methods, preparation, etc...).

The use of anabolic substances is no longer the monopoly of the USA.

In the field of weightlifting, heavy-weight category, in the three Olympic lifts, we note an improvement in the world record of about 10% for the period 1951–1961, while for the period 1961—1971, this improvement is nearer 20%.

(It should also be pointed out that without the "Anderson phenomenon" the increase obtained in the first period would be only 5%.)

Percentage of improvement in certain athletic events by series of eleven years (Men's world records)

	1936–1947* (in %)	1948–1959 (in %)	1960–1971 (in %)
Shot	1.5	8.3	11.2
Discus	4	7.6	12.4
Javelin	1.8	8.5**	7.2**
Hammer	0	14	10.1
High jump	0.9	2.3	5.8
Long jump	0	0	8.6****
Triple jump	0	4.1	4
Pole vault	4.9	0.2	12 ***
110 m hurdles	0	3.7	1.5
400 m hurdles	0	2.6	2
200 m	0	1.5	1
400 m	0.7	1.5	3.2
800 m	2.9	0.8	1.2
1,500 m	2.1	3.2	1
5,000 m	2.3	2.9	2.3

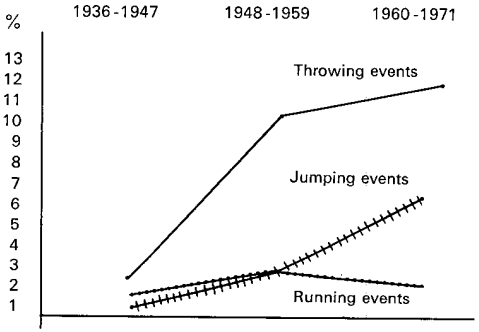
* Results partly distorted by the 1939–1945 war.

** Modern javelins are considerably less good than those used in 1959 (Held "gliding" javelins) hence only a slight improvement.

*** The advent of the fibreglass pole has radically changed performances and their significance. Comparisons are no longer valid in this speciality.

**** It should be pointed out that without the phenomenal leap of 8.90 m by Beamon at the Mexico Olympics in 1968, the world record would still be about 8.35 m, which would give an improvement of 2.6% for this event.

In terms of the period considered:



Percentage of improvement in the three main types of athletic event (men's world records).

The problem raised by the use of anabolic substances

These problems are many and complicated.

1. *Position of the medical profession*

From the medical point of view, doctors are almost unanimous in their condemnation of the use of hormonal anabolic substances...

2. *Positions of trainers and athletes*

In countries where the use of anabolic substances is current, a line of conduct is adopted and the athlete has but two possibilities.
Either he consumes this type of product, or as two young hopefuls of German sport did recently (Blaesius and Sasse), they cut themselves off from the race for records and give up competitive sport, because they refuse to use any form of doping to help them achieve rapid progress...

...As for the athletes, they are aware that, used wisely, anabolic substances can help them improve their performances but that the risk they are running is by no means negligible and many hesitate to take the step. However, all—and this is only logical—want to possess the same advantages as their foreign rivals.

3. *Positions of sports authorities*

After a certain hesitation regarding the line of conduct to be adopted, the heads of the world federations have reacted in their turn against the use of these products.
In 1966, the British Amateur Athletics Association condemned the use of hormonal steroids, followed in 1967 by the International Olympic Committee, to which 123 countries belong. (This organization considers that, except for medical reasons, such a practice constitutes doping according to the Olympic definition of the word)...

4. *Position of the specialised press*

The part played by journalists in the fight against doping or against any other form of illicit and dangerous aid to athletic progress is of the greatest importance.
Condemned in the United States and in the countries of the East, the use of anabolic substances in sport is also severely condemned by journalists in Western Europe and by those of France in particular...

Control and regulations

At the present moment it is impossible to carry out an effective check on an athlete suspected of using anabolic substances.
What are the difficulties?
Unlike the antidoping checks, where any trace of amphetamine is rapidly detected in the urine, for the product has been

since a course of treatment may be completed and stopped several weeks before the actual competitions, i.e. before the tests are carried out—without the effectiveness of the product being diminished in any way, the myotrophic effect still continuing (long-term effect).

In the urine or blood tests, the steroid has already been eliminated and even if a few traces remain, it is quite impossible to try to detect them...

... With regard to regulations, countries like the United States and Germany have just officially placed anabolic substances in the category of doping substances, which now represents an added difficulty for anyone trying to obtain them.

In France the problem remains unsolved. There is obviously something very wrong in a situation where it is possible to obtain a hormonal product with a powerful anabolic effect as easily as a tube of aspirin, without medical prescription. As far as we are concerned, we hope that the whole of the medical profession will become aware of the situation and try to do something about it...

... On the international level, it would seem that appeals to reason as well as the words of warning uttered by sports and medical bodies have not yet succeeded in obtaining any results, so all efforts will have to be concentrated on rigorous methods of detection, and checks will have to be made afterwards as a deterrent rather than before as a preventive measure.

One can only hope that new techniques will make it possible to detect and measure tiny traces of hormones or substances modified for some considerable time by the introduction of steroids into the organism.

We see no other solution and we think that nothing will be settled until then.

Finally, the methods of detection must be absorbed only a few minutes or a few hours before the effort demanded of the athlete (short-term effect), it is impossible to do the same with androgenic steroids, foolproof and subject to no possible contestation...

J.P.