FUNDAMENTALS OF SPORTS TRAINING

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FOREWORD

This publication is a textbook divided into three parts: 1. Introduction (characteristics of sport, training and theoretical and methodological problems of sport). 2. Main sections dealing with the preparation of an athlete for competitions, the process of training. 3. Sports training as an integral process.

The author has attempted to deal more fully, first of all, with those main problems which are highlighted relatively little in existing special literature.

The difficulties of a didactically strict exposition of extensive material on the theory and methods of sports training which in the last decade has been expanded with exceptional speed, are understandable. Realising only too well that he did not manage fully to overcome these difficulties the author sincerely invites businesslike critical remarks. Deep gratitude is expressed by him to all those who helped writing this work.

PART ONE

INTRODUCTION

Chapter One

Initial Concepts and the Subject of the Course

Sports training is a component of a broader phenomenon—sport. It appeared, developed and is developing at the moment in unity with other aspects of sporting activity. Therefore, to understand the problems of sports training it is important to have a general idea about the essence of sport as a whole.

1. ON THE ESSENCE OF SPORT

1.1 "Sport" in the Narrow and Broad Sense of the Word

Sport as a competitive activity. Some outward distinctive indications of sport express the notion "competitive activity proper". Here we speak about activity the specific form of which is competition in the proper sense of the word, i.e., rivalry, regulated so that definite abilities can be compared and their maximum identification ensured. Historically, this activity took shape mainly in the sphere of physical culture as a special field for identifying and comparing abilities in a unified form (physical and moral forces and the ability to use them rationally). In its modern form competitive activity reveals some specific peculiarities.

The main ones are:

a) organisation of activity on the basis of a s y s t e m o f c o m p e t i t i o n s with a consequent increase of the competitive level and requirements for achievement

(permission to take part in competitions of a higher rank directly depends on previous results of the athlete);

b) u n i f i c a t i o n of the composition of actions upon which competitions are conducted, the condition of their implementation and the method of evaluation of results. This is all recorded in official rules as general norms of a competition (today in many cases they have become international);

c) r e g u l a t i o n o f t h e b e h a v i o u r o f competitors in accordance with the principles of n o n - a n t a g o n i s t i c c o m p e t i t i o n, humanistic in character.

All these traits characterise sport in the narrow sence of the word. Taken together, they clearly distinguish it from other phenomena including those which are outwardly similar, in which the competitive moment is only one of the moments and not a specific basis of activity (art competitions and festivals, etc.). Proceeding from this, *sport in the narrow sence of the word can be defined as competitive activity proper, the specific form of which is a system of competitions, which historically has taken shape, mainly, in the field of physical culture of a society as a special sphere of identifying and comparing human potential in a unified form* (strength, abilities and the skills to use them rationally).

Sport in a broader sense of the word. The essence of sport, however, never boils down only to achievement of purely competitive goals. It is much richer. As an activity, which has a many-sided effect on man and as a sphere of diverse interhuman contacts it has an even deeper meaning, conditioned in the final analysis by the aggregate of basic social relations of which the given activity is a part. *In the broad sense of the word sport encompasses the competitive activity proper, special preparation for it and specific relations in the sphere of this activity taken as a whole.*

This definition does not reflect the entire richness, diversity and complexity of concrete manifestations of sport in society. In its application sport is a constant desire of man to expand the boundaries of his abilities, realised through special preparation and systematic participation in competition, connected with the overcoming of difficulties and based on an entire world of emotions, born of successes and failures in human relations. Sport is a popular spectacle

and a mass social movement of contemporary times.

As a many-sided social phenomenon, sport is an active factor in physical education, one of the basic forms of preparing a person for labour and other socially necessary types of activity, and, alongside this, one of the important means of the ethic and aesthetic education, satisfaction of the moral requirements of society, consolidation and expansion of international ties.

In the process of its historical development sport has occupied a prominent place both in the physical, as well as in the moral culture of a society. Its social significance continues to soar.

1.2. Diversity of Sports

When analysing specific kinds of competitive activity which branched out as sport developed and which formed its relatively independent components, we distinguish a m u l t i t u d e o f s p o r t s. Every one of them is characterised by its own subject for competition, by a special composition of actions and methods of conducting sporting contests (technique and tactics) and by its own competition rules.

Sports, which at present are becoming internationally more widespread, may conditionally be divided by the specifics of the subject of a competition and by the character of the motor activity of an athlete into the following five groups.

F i r s t g r o u p—sports characterised by energetic motor activity when athletes display their ultimate physical (motor) and will qualities; sporting achievements in these sports directly depend on the athlete's own motor abilities which are identified in the process of a competition. To this group belong most of the basic sports (boxing, wrestling, gymnastics, athletics, weightlifting, swimming, sports games, including active motor actions, fencing, etc.—in more detail see Chapter Two; 2.1).

S e c o n d g r o u p—sports in which athletes drive or control special technical means (motorcycles, cars, planes, yachts, ice-boats and so on). The sporting results in these sports are largely conditioned by external motor forces of artificial origin and the ability to use them rationally.

T h i r d g r o u p—sports, the motor activity of which is rigidly limited by the conditions of hitting a target from special sports weapons (rifle, bow and arrows, etc.).

F o u r t h g r o u p—sports in which the results of the modelling and designing activity of a sportsman are being compared (aviation and car models, etc.); modelling is the specific content of these sports, the character of which is given by the conditions of a competition.

F i f t h g r o u p—sports the main content of competitions in which are determined by the character of an abstract-logical winning over an opponent (varieties of the chess and draughts sport).

The sphere of sport therefore includes rather varied kinds of activity. A number of "ancient" sports (running, jumping, throwing, wrestling, etc.) originated from definite forms of work and then combat actions. The labour practice and military pursuits considerably influence the formation of modern sports (especially professionally-applied and militarily-applied). The forms of sports movements and actions invariably changed compared with their initial basis, developing in accordance with the requirements of the sporting activity.

Over the last century new sports were formed more often on the basis of the sport itself and related spheres of culture. Thus, in their time appeared, for instance, basketball, rugby, roller-skating, water-skiing, trampolining, rhythmic gymnastics, ice dancing and some other sports. It is also characteristic that the appearance of an ever greater number of sports is conditioned by technical progress allowing an expansion in the sphere of the sporting activity (parachute jumping, underwater sports, etc.).

An absolute majority of existing sports—the entire vast first group and the greater part of the second (in the above classification) are used in basic physical education as most effective factors for the direct development of physical abilities. Such sports will be further developed in future in accordance with the place of sport in the general system of education and the necessity to ensure a sufficient volume of man's motor activity following its reduction in other spheres of life (in the production sphere, in everyday life, etc.). Concurrently the degree of the spread of sports of the other groups will obviously increase.

1.3. On the Importance, Factors and Tendencies of the Development of Sporting Achievements

A sporting achievement in each case demonstrates an athlete's ability in the selected sport and the evaluation of this by some acknowledged criteria of the sport (conditioned physical victory or a win from an opponent evaluated in goals, points and so on, the improvement of a result expressed in measures of time, distance, weight, etc.). The highest (absolute) sporting achievements are in a way standards of man's abilities, realised in sport at a given moment of its development. Having this in mind, any athlete may assess his own personal sporting results and see if he can improve them. It is in this that the standard and stimulating role of sporting achievements lie.

A sporting achievement is always a many-sided phenomenon (in the sense that it depends on many reasons). The following factors and conditions, which directly or indirectly effect the dynamics of sporting achievements in a society, can be singled out: 1) individual gifts of athletes and a degree of their preparedness for an achievement; 2) the effectiveness of the system of training, its content, organisation, material and technical provision; 3) the scope of the sporting movement and the general social conditions of its development.

All other conditions being equal, the level of an individual sporting achievement is derived from the athlete's gifts and the degree of his preparedness for such an achievement. The first of these factors is relatively conservative because it is based on natural inclinations. The second one is dynamic—it constantly changes as the athlete engages in sport as a consequence of an expedient activity. It means that purposeful training, in the course of which an athlete masters rational forms of movements, improves them and, purposefully, developing his gifts, develops the abilities necessary for his progress in sport, is a decisive factor which derectly influences the improvement of his results. One of the necessary conditions of this is a considerable expenditure of the athlete's effort on self-improvement. It is notable that achievements at the present-day stage of development of sport swiftly increase with a corresponding increase

in the volume of training. Even the most gifted athlete will not score outstanding results if he does not work persistently, systematically training and preparing himself for the next achievement. In this connection *sporting achievements are the indicators of the volume of useful expenditures of the athlete's efforts for self-improvement, the measure of his success on this road.*

As the system of sports training (especially its scientific and methodological foundations) improves, its effect on the general level of sporting achievements increases. It is indicative that Olympic records of the first modern Olympic games, which in those times seemed to be outstanding, today are within reach of thousands and thousands of rank-and-file athletes. This is explained, in particular, by the evolvement of new, scientifically substantiated training methods and means of execution of sport exercises (sports technique and tactics), improvement of sports gear and equipment, as well as other components and conditions of the system of sports training (its organisational forms, conditions of training and rehabilitation after sport loads, and so on). It becomes clear that *sporting achievements, their general level and dynamics appear as generalised indicators of the development of sports culture in a society, as vivid criteria of the quality of the sports school, which has shaped up in this or that country and to a certain degree an indicator of cultural progress as a whole.*

Sport as a social phenomenon is organically included in the system of social relations and is conditioned in its development by the social, economic and related factors. That is why the level of sporting achievements in this or that country depends in the final analysis on the conditions of material life of a society and its social organisation, determining (through a number of indirect links) the development of the sports movement. As a sociological and statistical analysis testifies, the achievements of various countries on the Olympic arena correlate with the indicators of the people's material well-being (calculated by the national income and the calories of nutrition per capita of the population), as well as with the indicators of the average life span, general number and literacy of the population.

However, the effect of these factors on the increase of the sporting achievements becomes apparent through

a number of indirect links and conditions including the system of training. Thus, the country's higher economic indices do not automatically guarantee its superiority in sport: much depends on how the existing possibilities are used. A society's social order and the actual conditions it grants for the progress of sport play a decisive role.

Thus, the sporting achievements are conditioned by many factors reflecting man's success in perfecting his abilities and are one of the indicators of the development of culture of a society. As such, they are of considerable value both for a personality and a society.

The reason for an amazing progress in sporting achievements lies, above all, in general social factors of the development of sport and the resultant increase of its general cultural, ideological, pedagogical, aesthetic and economic significance. The athletes of the Soviet Union and of other socialist countries where most favourable conditions for mass sport and sport of the highest achievements have been created, make an increasingly weighty contribution into the sporting achievements of mankind. Having emerged recently on the Olympic arena (1952) the Soviet athletes immediately became recognised as some of the leaders of world sport. The sporting achievements of the athletes of other socialist countries also grow at a no less impressive rate (*Table 1*).

1.4. The Social Functions of Sport and the Main Aspects of the Sports Movement

The growing role of sport in society. Modern sports sociology emphasises its ever growing and many-sided role in society. Analysis of a number of specific functions of sport as social phenomenon and its diverse links with other social phenomena provides us with scientific understanding of this fact.

It is impossible to identify sport's actual essence if we try to "deduce" from it simply its biological or biophysical prerequisites (things like a spontaneous requirement in the motor activity, or a desire to release one's "innate aggresiveness" and so on). Attempts to picture sport in isolation into which a man plunges trying to escape the bitterness of everyday life for unrestricted self-expression are also bankrupt (one of the widespread conceptions of bourgeois sport sociology). Without denying the significance of sport's role

Table 1

The Performance of the Soviet Athletes at the Olympic Games

Results		Olympic games, years												
		Summer Games							Winter Games					
		XVth	XVIth	XVIIth	XVIIIth	XIXth	XXth	XXIth	VIIth	VIIIth	IXth	Xth	XIth	XIIth
		1952	1956	1960	1964	1968	1972	1976	1956	1960	1964	1968	1972	1976
Number of participants		294	283	284	320	311	372	430	54	62	69	74	84	94
Medals won	Gold	22	37	43	30	29	50	47	7	7	11	5	8	13
	Silver	30	29	29	31	32	27	43	3	5	8	5	5	6
	Bronze	19	32	31	35	30	22	35	6	9	6	3	3	8
Unofficial team scoring	Points	494	622.5	682.5	607.8	590.8	664.5	788.5	103	146.5	162.0	92	120	192
	Place	1–2	1	1	1	2	1	1	1	1	1	2	1	1

in the self-assertion of a personality, Marxist sociology shows that it can be regarded as a truly human activity only in its social aspects. As with individual sporting activity, the sporting movement on the whole is steered by social forces towards the attainment of goals significant for a society or for certain social groups and classes. Sport performs socially given functions. We give brief characteristics of the main ones later.

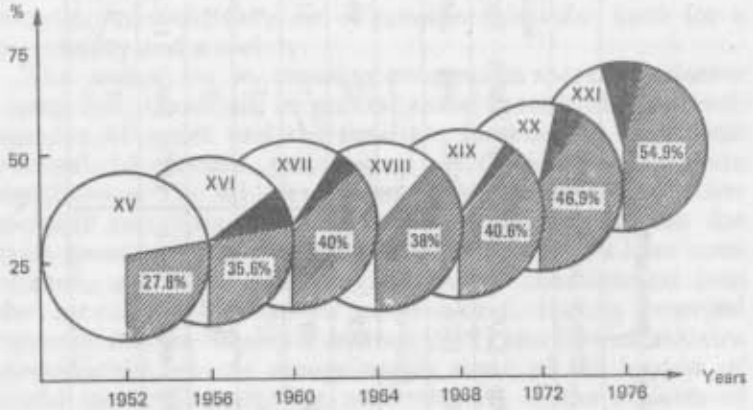

Fig. 1. **Points amassed** (in per cent from the total number of points) **of the unofficial team scorng won by the athletes of the socialist countries in the Olympic Games since 1952.**

Standard and heuristic significance of sport. When sport was initially defined (1.1.), it was noted that it grew as an activity in which were seen unified methods of objective comparison of achievements. Achievements recorded in sport become standards for evaluation of a man's possibilities and at the same time play the role of landmarks on the way to further perfectioning.

A creative, searching, heuristic character is inherent in sporting activity aimed at the highest achievements. The road to new records is an eternal search. Anyone who aims at a new sporting achievement must find new means of mobilising and increasing the possibilities of his organism and learn to use them most effectively so as to reach the level of sports proficiency no one has reached before. Like a gigantic creative laboratory sport finds the way to the

summits of man's abilities. New means of improvement created in the process are brought within reach of everyone as they embrace mass practice.

Sport as a means of comprehensive development, education and preparation for life activity. The fact that sport aims at the highest achievements, is creative in character and also because of its other traits, makes it one of the most active factors for a comprehensive development of a person, perfecting his physical and psychological abilities and developing skill and knowledge useful in life. From the beginning of its history sport became an important element of social practice of education, an effective means to solve educational tasks, especially in preparing the growing generation for work and other socially necessary kinds of activity.

The high level of functional possibilities of an organism reached in the process of sporting activity and the rich store of useful skills and knowledge, created simultaneously, determine in certain measure the degree of general preparedness of an athlete for life.

It has been shown that many modern sports present in fact a specific means of physical education. They allow a maximum degree of development of physical abilities, motor skills and knowledge. This is facilitated by the fact that sport aims at the highest achievements and is highly specialised. Sporting activity provides rich opportunities for moulding the will, emotions, moral and intellectual qualities of a person.

Sport is justly called the "school of will-power" and the "school of emotions". In everyday situations not often do we confront such high requirements of will-power as during sporting competitions and in sporting activity in general. The moulding influence of sport on a person and, hence, its importance in moral upbringing are conditioned by the breadth and intensity of human relations in the sphere of the sporting activity. These relations on the whole are never narrowed down to the purely personal. Intercollective, intra-national and international sports ties bring an athlete into the sphere of broad social relations thus exceptionally increasing the role of the sporting activity as a factor of the social moulding of a personality. Such moral traits in a person as nobleness, honesty, respect for one's opponent, an

ability in contests to be above elementary emotions and an ability to subject one's behaviour to the requirements of sporting and general human ethics are thoroughly revealed and tested in the complicated situations of a sporting life.

Naturally, the vast opportunity sport offers for a solution of educational tasks is not realised by itself. Moreover, the same sporting factors of educational value may, under certain conditions, facilitate the moulding of contrary traits of personality. The educational significance of sport depends on who makes use of it and to a greater degree on determining social direction of a sports movement in this or that society. In conditions of present-day socialist society sport is organically included into the system of the comprehensive upbringing of a new man—a builder of communism, who displays more fully an inner richness, moral purity and physical perfection. The aim of the sporting movement here envisages an inseparable unity of an all-round, harmonious development of a personality and the preparation of a person for a creative work and the struggle for the highest ideals.

Sport's health and rehabilitating functions. While having a beneficial effect on everyday activity and the development of positive emotions, sport is one of the most popular forms of healthy and active rest and recreation. It is hard to overestimate this role of sport if activity does not simply rest on episodic sporting undertakings. Compared with other kinds of activity undertaken for similar purposes, sport makes considerable demands on the functional abilities of an organism and, therefore, claims a sufficiently serious attitude towards itself.

The aesthetic qualities of sport as a spectacle. From time immemorial sport has been popular as a spectacle. Modern means of mass communication, especially television, considerably expand the audiences. Sporting events like the Olympic games or world championships are held today in a truly world-wide audience (for instance, more than 1,000 million fans watched the Olympic Games in Montreal and approximately 2,000 million TV viewers—the 1980 Moscow Olympics). The effect of sport on the emotional world of mankind has increased correspondingly. It is not accidental that sport has been widely reflected in various arts and itself has acquired artistic traits. Sport's popularity as a spectacle

can be explained by its emotional appeal, by the acuteness of emotions it raises influencing the personal and collective interests of many people, as well as by the universality of "sports language" understandable practically to any person.

Sport as an area for broad social relations. Directly in the process of sports activity people enter into most varied relations: those of rivalry and friendship, relations among the members of a team and among competing teams, between athletes and coaches, between athletes and fans, etc. These specific sporting relations are always to one degree or another included in a broader system of social relations. The aggregate of the given relations is one of the forms of a social integration, i.e., of bringing together and uniting people into definite organisations on the basis of the unity of interests and practical activity. The character of such integration depends to a large degree on the social nature of society. Sporting activity in a socialist society, free from class antagonisms, in principle and form corresponds to the general public interest. Assuming under these conditions a truly broad scope and pattern, the sports movement is one of the broadest forms of integration, drawing people into active public life, guided by the leading social forces towards a common aim—the building of a communist society.

As the sphere of general social relations influencing the moulding of a man's outlook, spreading and introducing definite ideas, sport has a serious ideological significance. Although relations arising directly in the process of sporting activity take shape not as typically class relations, a class society cannot be indifferent to sport's ideological thrust. Its natural attractiveness for the broadest section of society, the emotional involvement in "conflicts" which can be easily linked with the honour brought to this or that collective, nation or state, as well as other possibilities, affect directly people's consciousness and feelings and make sport a convenient channel for introducing certain ideologies.

The ruling circles of the imperialist states, as is known, persistently try to use sport for implanting bourgeois ideology. They are interested in international sports ties, above all, as a means of propagating an imaginary superiority of the "Western way of life". The slogan "sport outside politics" in practice becomes nothing but political hypocri-

cy in this case. Reactionary forces do everything to place sport at the service of anti-communism, chauvinism and race discrimination. These tendencies are countered by the general humanistic trait of the international sports movement and especially sports practice in the socialist countries, consistently upheld in a spirit of the lofty ideals of cooperation and friendship among nations.

Truly humane foundations of sport find their full expression in the mainstream of the progressive sports movement thanks to which they become an important factor of the *ties between* peoples. In our time the international sports movement has developed globally. This can be seen in the example of the Olympic movement—one of the broadest of international contemporary movements.

Sport and economics. To complete the characteristics of sport we must bear in mind its considerable economic significance. The material investments of a society into the development of sport are returned many times, above all, by greater work efficiency, better health and creative longevity—society's most valuable assets.

The financial returns obtained from sporting events, from the use of sports facilities and from other means directly or indirectly connected with sport are also of economic importance. In a socialist society such financial returns do not determine the investments in sport. In capitalist conditions, however, investments in sport frequently become the main aim in itself. Sport becomes involved into the sphere of business and finds itself within the jurisdiction of its laws. Its essence can become so distorted in the process that it assumes anti-humane traits.

* * *

Sport therefore is a many-sided social phenomena which under certain social conditions has general cultural, ideological, aesthetic, pedagogical and economic significance. Hence, the reasons of an all-increasing attention to sport in a society become understandable.

A fuller ensurance of conditions for a comprehensive and harmonious development of all its members is the basis for accelerated progress of sport in a communist society. The all-round development of the personality, which for many centuries remained only an ideal unattainable on a

society-wide scale, acquires, in the period of transition to communism, its material content and is brought into life in accordance with the laws of social progress. It is on this basis that sport blossoms as an important factor in man's harmonious development.

The unity and specifics of various aspects of the sports movement. In the process of development certain social functions express themselves in typical trends of the sports movement. Thus, under certain conditions, we can define: 1) basic sport which includes, above all, general educational, general training and health functions; 2) sport of the highest achievements, also called not very accurately "Big Time Sport"; 3)professionally-applied sport (sport as a means of directly applied training for some professional activity); 4) recreative sport (sport as a means of a healthy recreation, active rehabilitation and organisation of interesting leisure time), and certain others. While being interlinked aspects of the one phenomenon, they are at the same time united and have peculiarities of their own.

To basic sport belongs, first and foremost, much of "school sport", cultivated in general educational establishments, as well as the greater part of amateur sports, which ensure general physical preparedness and the achievement of results on a mass scale. The basic, professional, applied and recreative sports make up at the same time the basis of the mass sports movement. Engagement in sport within the framework of these sections of sports practice decisively depends on the regime of educational or professional activity. It is limited therefore in time expenditure. The achievements in principle may not be the highest, although individually they may be considerable.

Sport of highest achievements as its name suggests is directed to an absolute maximum of sport achievements including those on an international level. In this respect the role of sport as an activity expanding the borders of human abilities is expressed most fully. Naturally, with this approach sport activity becomes similar to intensive creative work. In certain periods it occupies a dominant position in the general regime of daily activity and demands special organisation in accordance with the requirements of highest sporting performance (as a rule, daily training including increased and at times maximum

loads, and a daily schedule strictly coordinated with it or with participation in competitions etc.).

While understanding the specifics of sport of highest achievements, it must not be concluded that it is connected only with professionalism. In the final analysis everything depends on concrete social conditions. Soviet society creates for everyone who takes upon humself the honourable and difficult task of blazing the way to new sporting heights, the necessary conditions for a combination of sporting activity with general and specialised education, as well as with active participation in production and other useful spheres of activity. In such conditions the problem of sports professionalism no longer exists. A relatively small group of athletes involved in a mass movement is engaged in the sport of highest achievements (*Table 2*).

Table 2

The Quantity and Qualifications of the Athletes in the Soviet Union

Indicators	The number of active athletes according to 1974 data		Indicators of the dynamics of training athletes with rating (,000)		
	,000	as % of the total number of athletes	in 1974	in 1975	1980 (estimated)
The total number of athletes engaged in sport sections	39,735.7	100			
of them: athletes with sports rating	15,314.3	38.5	9,076.9	16,586.2	17,500
athletes of the 1st sports rating and Candidates to Masters	364.6	0.9	194.0	217.5	23,5
Masters of Sport	31.4	0.08	7.2	7.2	7.9

Note: 1,510 Masters of Sport of International Class were trained in 1971-1975 and 683 athletes became European and world champions.

These relations, in principle, are quite regular: not everyone has an opportunity to rise to the level of highest result but all are in a position to benefit by participating in a mass sports movement. The sport of highest achievements, being the vanguard of the sports movement, plays a leading role in respect to other sports practice: mapping out current boundaries of achievements, blazing new roads for them, giving mass practice advance experience. On the other hand, sport essentially depends on mass sports practice. It stems out of basic sport and develops on its basis. The link here, therefore, is not one-way but both ways. Although the level of highest achievements in this or that country does not always directly reflect its mass sports results, on the whole, as a general tendency, these levels definitely correspond. The steady growth of results of athletes from socialist countries on the basis of an all-round development of the mass sports movement is the most convincing proof of this.

The mass character and a striving towards highest achievements are inseparable traits of the Soviet sports movement. "We must continue to raise the international class of our sport. But the main thing," Leonid Brezhnev, General Secretary of the CC CPSU, emphasised, "is the mass character of the sports movement, the development of physical culture, embracing the entire youth, conditioning of will qualities, physical preparedness of the young men and women for labour and defence."* In the programme of social development and raising the standard of living of the people mapped out by the 26th CPSU Congress, it is planned actively to develop mass-scale physical culture and sport.

2. DETERMINATION OF THE NOTION: "TRAINING AN ATHLETE" AND "SPORTS TRAINING"

The notions "sports training" and "training an athlete" coincide in many aspects but are not similar. The second notion is broader both in scope and content and, therefore,

* L. I. Brezhnev, *On Communist Education of the Working People (Speeches and Articles)*, Moscow, Politizdat, 1975, p. 197 (in Russian).

can serve as one of the starting points in defining the notion "sports training".

Training an athlete. Among factors making for sporting success it is not difficult to single out, on the one hand, internal factors (possibilities and the state of preparedness of an athlete for an achievement) and on the other—the external ones (the means, methods and conditions with the help of which it is expedient to influence the development of an athlete and ensure his readiness for an achievement). *The preparedness of an athlete for an achievement is a complex dynamic state, characterised by a high level of physical and psychological efficiency* (physical and psychological readiness) *and the degree of perfection of the necessary skills and knowledge* (technical and tactical preparedness). An athlete arrives at this state only as a result of a corresponding training. Sports activity in this respect is an activity directed at grooming an athlete for an achievement and at steadily enhancing his preparation. Many other factors are brought into play in his preparation (means of rehabilitating strength after loads, special nutrition, organisation of a general regime in accordance with the conditions of sports activity, etc.). All these factors make up the elements used in combination within the framework of training an athlete. Thus, *athlete's training is a multi-sided process of the expedient use of aggregate factors (means, methods and conditions) so as to influence the development of an athlete and ensure the necessary level of preparedness.*

As a many-sided system the training of an athlete includes:

a) sports training;

b) competitions (to this or that degree they serve as a means of training);

c) the use of extra-training and extra-competition factors supplementing and intensifying training and competitions or speeding up the rehabilitating process after loads.

These can be regarded as the major components making up the s y s t e m o f s p o r t s p r e p a r a t i o n.

Sports training. Generally, it can be defined as the basic component and form of an athlete's training. The main characteristics of sports training are as follows:

Firstly, sports training in its typical and most effective

form is a pedagogically organised process characterised by all the main traits of a strictly directed process of teaching, upbringing and self-education (the guiding role of the coach, expressed in his direct control or through general guidance of the athlete's activities, organisation of training sessions in correspondence with the general and special principles of the pedagogical character and so on).

Secondly, a system of exercises, so arranged as to reach a maximum developing effect in the condition of full control of the process of perfectioning (or in a more narrow sense of training capacity) constitute the methodological foundation of sports training. It does not mean that sports training lacks other methods than those of exercises. The thing is that a system of exercises subordinated to the demands of optimal development are the methodological pivot of training, and basis of its structure (here training basically differs from the non-training forms of the athlete's training).

Thus, *sports training is the basic form of an athlete's training. It is the preparation systematically organised with the help of exercises which in fact is a pedagogically organised process of controlling an athlete's development (his sporting perfectioning).*

This brief description approximately characterises sports training. Later it will be presented in more detail as the main sections of the course are discussed.

3. THE COURSE "FUNDAMENTALS OF SPORTS TRAINING" AS PART OF SPORTS THEORY AND STUDY DISCIPLINE

3.1. On the Structure of Sports Theory

Sport, which at one time was an empiric field of culture, in the contemporary epoch became an object of comprehensive research. Together with the tempestuous progress of sports practice and under the effect of its requirements a vast complex of knowledge of the theoretical, applied, humanitarian and natural scientific character is being formed in this sphere. On the whole, the system of knowledge about sport as a scientific branch is relatively young and is in its ripening stage. There are a lot of "grey areas" as yet. The characteristics of sports theory given below is to a considerable degree a tentative one.

Proceeding from the definition of sport within the structure of scientific and practical knowledge about it, two big sections must be, first of all, singled out here: 1) the theory of competitive activity proper (sports competitions) and its direct results (sports achievements); 2) the theory and methods of an athlete's training. Together they comprise a nucleus, a central field of the scientific and practical knowledge about sports (*Fig. 2*), since they reflect its factual integrity in the generalised form and on the strength of it have direct practical significance.

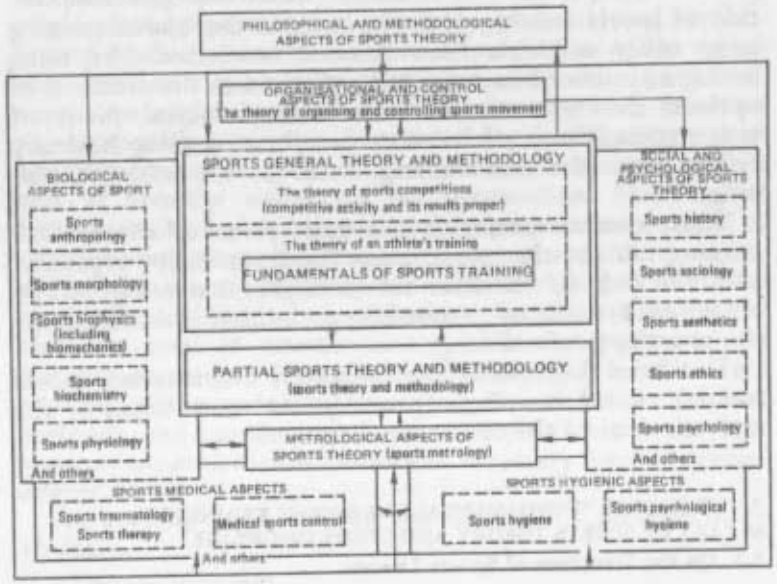

Fig. 2. **The main sections and aspects of sports theory (tentative diagram of the structure):** inter-penetration of the sections and aspects connected with the formation of a border knowledge (other explanations in the text) is shown through a partial superimposition of the contours.

Scientific knowledge has accumulated and differentiated a number of branches in the field of general sports theory. Some of them have already formed as relatively self-contained disciplines while others are in the process of so forming. Thus, the theory of the sports techniques, tactics and work capacity, the theory of organising competitions, determining and evaluating sports results are being formed in the general aspect of sports competitions and achievements (the content of such sub-sections has an inter-disciplinary character and is so far partly represented in the most diverse disciplines); in the theory and methodics of an athlete's training the main part of the content is represented by an already-formed discipline—"Fundamentals of sports training" (in a number of countries it is called somewhat differently: "The teaching about training", "The theory of sports training" and so on) and by its specialised branches (theory and methods of certain sports). At present another branch of knowledge about an athlete's training is being intensively formed. It deals with the scientific and practical foundations of its extra-training and extra-competitive forms (so far this branch has no official name).

The system of knowledge about sport includes a number of relatively particular sections and sub-sections reflecting certain aspects or phenomena directly linked in one of its aspects (see diagram). In the biological aspect sport is being studied by specialised branches of physiology, biochemistry, biomechanics, morphology and other biological sciences. It is also examined in the historical, sociological, organisational and control, ethical, aesthetical, psychological and other humanitarian and related aspects. This finds its reflection in corresponding sections of sports theory which have already formed or are in the process of formation (sports theory, sports sociology, sports psychology, and so on). Moreover, sport and medical, sport and hygienic disciplines have come into being which play an important role in the scientific and applied provisions of an athlete's training.

Particular sections and aspects of sports theory highlight many essential details necessary for the understanding of the pattern of sports activity, expediently regulating it and controlling the process of perfectioning. However, regardless of how considerable are the facts obrained by particular disciplines, taken by themselves, they do not present a picture as a whole. They can lead astray from the understanding of the essence of the phenomenon as a whole if they are not brought together on the basis of a generalised reflection of all the main properties and relations. General theory is called upon to give such a reflection in the sphere of sport. Of particular importance are the philoso-

phical and methodological aspects which underlie all sections as an application of materialist dialectics to the cognition and solution of sports problems.

All the sports structure links are interconnected. Many of them connect sports theory with related sciences. Especially close are the theory and methodics of physical education and general pedagogics. It must be taken into consideration that sports theory in a big part has been developing within physical education theory (exactly in that part where sport is regarded as a means of physical education). Therefore, their content is inter-connected and partially coincides.

3.2. The Formation of a Course of Fundamentals of Sports Training

The formation of a course of fundamentals of sports training has resulted from an ever increasing acceleration in development of the scientific and practical knowledge in the field of sport and one of the natural expressions of the processes of differentiation and integration, characteristic of any developing branch of science. It has concentrated generalised knowledge about the main forms of sports training, its most essential characteristics and has defined its content. It has become the main part of its theory and methodics.

As a study discipline, the course of fundamentals of sports training has taken shape answering the requirements of the sports coach's professional education. It was included in the syllabi of sports faculties at the institutes of physical culture as a basic discipline of a general theoretical and methodological character (since 1967), in the system of brush-up courses and self-education of coaches and athletes. Evolving general approaches to the treatment of the essence of sports training, the given course has methodological importance for particular sports disciplines (the theory and methods of sports). It is closely inter-related with them, is enriched by their materials and enriches them with broad generalisations.

The practical experience and positive results of many research works have been reflected in the process of the formation of the course of fundamentals of sports training.

All that is progressive in the history and sports modern theory and practice abroad has been critically absorbed alongside the experience of the development of the Soviet sports school. The achievements of Soviet sports theory and methods, as is known, enjoy wide international recognition. They have been especially consistently used in sports schools of the fraternal socialist countries. In their turn, the experience of the creative development of sports science and practice in other socialist countries presents an ever greater interest for the Soviet sports school.

3.3. The Problems and the Order of Presentation of the Present Course

The course of fundamentals of sports training is an aggregate of the generalised knowledge concerning an athlete's preparation being realised in its main form—in the form of training. The course is aimed at identifying the most essential traits, the main content and the requirements of planning the training, common for various sports. The aim of the course is, above all, to identify the essence of training taken in a general form on the basis of the recognition of the objective requirements of the training process and to formulate scientific and practical propositions having principal importance for various sports.

If we try and define briefly a multitude of questions arising in the practice of sports training, they can be reduced in their application to the three main ones. First, questions about the general grounds of sports training and the setting of corresponding tasks; secondly, questions about the choice of adequate means for the realisation of given tasks; thirdly, questions how to plan training sessions—by what methods, in what particular form and on the basis of what common structure. It is not difficult to note that the sequence of these questions corresponds to the logic of any expediently organised activity. This logic is accounted for in the structure of the course as a whole, as well as in the formation of its subsections.

In the accepted order of expounding the course an account is taken of the fact that before turning to a detailed analysis of certain aspects of the content and methods of planning a training session, it is expedient to compile its

preliminary characteristic as a whole. This helps to take a better bearing of details and helps to comprehend them as a whole.

The first part is in essence an introduction to the course. Besides giving initial definitions, preliminary characteristics of sports training and some of its laws it characterises sport as a social phenomenon. Strictly speaking, the latter is the subject of sociology and of the general sports theory, but it is impossible deeply to comprehend the essence of sports training without an idea about the social essence of sport.

The second part is devoted to an analysis of the main aspects (sections) of the athlete's preparation making up the content of the training process (physical, psychological, technical and tactical training). They are examined with an emphasis on the tasks, means and specifics of training methods, as well as their place in the general process of moulding an athlete. Extra-training forms of an athlete's preparation are touched upon in this part of the course, as in other parts, only so far as it is necessary to comprehend their interrelation with sports training.

The third part encompasses the problems of the general structure of the training process or, in other words, the rules of its planning as a whole beginning with certain training sessions and ending with the stages of training of many years. Also discussed here is the organisational and methodological problems (planning, control and conditions of controlling the training process).

Thus, the course is expounded in accordance with the logic of proceeding from the whole to its components and from them back to the whole, examined as a result with due account being given to the aggregate of basic components and links (from the brief generalised characteristics of sport and of sports training to a detailed analysis of its sections and then to an aggregate picture of its structure).

The course in its present state is characterised (apart from the above) by certain peculiarities which in a certain sense are of a temporary, transient nature. They are mainly determined by the fact that the course as yet has not taken final shape. Although in its essence it is a generalised one, it so far does not reflect all the general aspects of training in various groups of sports. It examines mainly those aspects which characterise training in sports which represent an

active motor activity connected with maximum manifestations of physical abilities.

Account must be taken of a certain irregularity in the development of knowledge about sports training and phenomena connected with it. At present the problems of physical training of an athlete and the structure of separate training stages and periods and certain most general problems of its theory have been studied more extensively, while the peculiarities of training at various stages of the many-year preparation of an athlete, the problems of the control of the athlete's psychics in the process of training and competitions, methods of direct perfectioning of the sporting and technical skills at a stage of highest mastery and certain other problems have been studied less extensively. Naturally, this circumstance cannot but have an effect on the expounding of the corresponding sections of the present course.

Chapter Two

Introductory Characteristics of Sports Training

1. THE AIM, TASKS AND THE MAIN ASPECTS OF THE CONTENT OF SPORTS TRAINING

As has been pointed out when discussing the social essence of sport, the goal of achievements to which training in the Soviet school is aimed, is inseparable from the common goal of the communist system of education. In sports training the common aim of education is applied to the peculiarities of the sporting activity assuming a direct link with sporting achievements. But no matter how important sporting results are as a specific (immediate and intermediate) aim apart from the general social and pedagogical positions they cannot in the final analysis be aims in themselves. There must always be a more essential aim on the way consisting of the *development of the spiritual and physical abilities of an athlete through the achievement of high sporting results as factors for the harmonious moulding of a personality and upbringing in the interest of society.* Only on these conditions sport (sports training, in particular) retains its social and pedagogical significance.

Common aims determined by the trend of the social system of education should, therefore, be set and resolved in sports training in unity with them. In sport and applied relation they belong to the main sections of an athlete's training. We can distinguish between psychological, (in the broad sense of the word), physical, technical and tactical training. Each of these sections has components relating to the general training of an athlete, as well as those relating to special training.

The general training of an athlete does not boil down to the selected sport for specialisation but expands the prerequisites for successful engaging in the selected sport and promotes perfectioning in it on the basis of the comprehensive development of an athlete. Special training is a direct factor of specialisation in the selected sport. It includes teaching in technique and tactics of the given sport, instilling physical and psychological abilities which answer the specific peculiarities of the selected sporting activity.

The following main tasks are resolved proceeding from the general trends of education and training of an athlete in the process of sports training:

1. **The tasks of the ideological, moral, aesthetic, intellectual education and the special tasks in the field of an athlete's psychological training.** The general educational tasks of the Soviet sports school are, above all, the tasks of the communist, ideological and moral education. Other general tasks of the system of comprehensive education (promoting aesthetic development, a broad satisfaction of cognitive interests, etc.), as well as the specific tasks of the sporting and aesthetic education (connected with mastering the norms of the sporting ethics), intellectual and special psychological preparation of an athlete for sporting achievements are resolved on the basis of the direct moulding of an athlete's consciousness and behaviour in the spirit of the requirements of the moral code of the builders of communism. The latter (applied and specialised psychological preparation of an athlete) includes the moulding of psychological qualities answering the demands of the chosen sporting activity, the forming of its motivating foundation, the setting of targets for sporting achievements and the regulation of the emotional and will qualities in the process

of training and competitions.

2. **The tasks in the field of an athlete's physical training.** These are the tasks of instilling physical abilities necessary in the selected sport (strength, speed, endurance, etc.) and the tasks of general physical training in school to attain harmonious physical development and to strengthen health.

3. **The tasks of an athlete's technical and tactical training.** To these belong the tasks of teaching sports technique and tactics, the moulding and perfectioning of knowledge and skills, promoting the achievements of sporting mastery, the tasks of moulding tactical thinking of an athlete and of his other qualities upon which his sporting and technical and tactical prowess directly depends.

The aggregate of the tasks formulated here in the briefest way is sufficiently detailed depending on the individual abilities of an athlete and on the demands of a sport chosen for specialisation, the level of the preliminary sporting preparedness, the training stage and other circumstances. This is expressed in a ramified system of particular tasks which have a definite interrelation and coordination. The fundamentals of their treatment are examined in detail in the subsequent sections of the course.

These tasks are being resolved not only within the framework of sports training which embraces in one degree or another the main aspects of an athlete's training, but (as it has already been pointed out) does not exhaust them. The physical training and practical sections of the technical, tactical and special psychological training of an athlete are represented most fully in sports training. A number of the listed tasks are resolved also in the extra-training forms of training. The determining role in the realisation of the general educational tasks belongs to the entire social system of education.

The level of an athlete's training is a complex result of the solution of the practical tasks in sports training. It is expressed in the increased level of the functional efficiency of his organism, in the specific and general work capacity and in the degree of the perfectioning of sporting skills. The complex result of the solution of the applied tasks of any athlete's training on the whole is his comprehensive preparedness for a sporting achievement, which is made up from his physical, technical,

tactical and psychological preparation. At present most of these components are being evaluated, planned and controlled in the quantitatively definite indicators (test indicators found out with the help of control exercises, functional indicators of the sporting and medical control, etc.) and in a general form—in sporting results.

2. MEANS AND METHODS

The main specific means and methods of sports training are represented by a system of training exercises. In addition competitions and certain additional factors intensifying training effect or accelerating the rehabilitation of work capacity are organically included into the sports training system. Pedagogical means and methods are widely used as well in sports training as in any other pedagogical process.

2.1. The Main Specific Means and Methods of Sports Training

2.1.1. Competitive, Special-Preparatory and General Preparatory Exercises

Their likeness (or difference) with the selected sport as the subject of specialisation is one of the most essential indications of the classification of the kinds of exercises used in sports training. According to this indication all the exercises are sub-divided into competitive and preparatory, the latter, in their turn—into special-preparatory and general preparatory.

Competitive exercises. They are those integral actions (including intricate aggregate actions) which serve as the means of conducting a sporting struggle and are performed in the same way as during competitions. The notion "competitive exercise" in this sense is similar to the notion "kind of sport".

In the methodological aspect it is important to distinguish the competitive exercises proper and the training forms of the competitive exercises. The first are performed in real conditions of sports competitions, in full accord with the rules of the competition established for the given sport. The latter,

in the content of action, fundamentals of their structure and general direction, coincide with the competitive exercises proper but differ from them, since they are performed during training and are aimed at the solution of training tasks (they present something of a model form of the competitive exercises proper).

Reviewing existing sports it is easily seen that many of them have both analogous and clearly different traits. If we limit ourselves to the kinds of competitive exercises representing an active motor activity, several specific groups and sub-groups, represented in *Table 3* can be singled out among them.

Table 3

Classification of Certain Competitive Exercises (Sports)

Initial indication of the general group	Groups	Sub-groups and kinds of exercises
Mono-structural exercises (relatively stable forms)	1. Speed and strength exercises	A. Jumps (athletic and so on) B. Javelin, discus, hammer, shotput, etc. C. Lifting weights (individual dual exercises of the weightlifter, exercises with dumbbells) D. Sprint (track and field and other cyclic exercises of maximum power)
	2. Cyclic locomotions for endurance	A. Locomotions of sub-maximum power (middle-distance running, 100 and 400-m swimming, etc.) B. Locomotions of intensive and moderate power (3-5-km and more running, 800-m and more swimming, etc.)
Polystructural exercises (variable forms, depending on the conditions of competitions)	1. Sports games	A. Games characterised by a heightened intensity and a possibility of being periodically excluded from the game (basketball, ice hockey and others) B. Prolonged games characterised by a relative continuity (football, Russian hockey, etc.)
	2. Sporting encounters	A. Fencing B. Boxing and wrestling

Continued

Complexes of competitive exercises, united into an independent object of sporting specialisation (dual and combined events)	1. Dual and combined events with a stable content	A. Homogeneous two-event competitions and combined events (skating four events, Alpine three events, etc.) B. Non-homogeneous dual competitions and combined events (athletic decathlon, modern pentathlon, ski dual and combined events, etc.)
	2. Dual and combined events with a periodically renewed content	Sports "arts" (gymnastics and rhythmic gymnastics, acrobatics, figure skating and diving)

Specialisation in modern sport follows the road of a thorough perfectioning, as a rule, in one selected kind of competitive exercises or in a few very close kinds either in dual or in combined events (as a separate sport). Other competitive exercises are frequently used as additional sports but in essence only as preparatory exercises.

The competitive exercises of the selected sport play an extremely important role in training, because without them it is impossible to recreate the sum total of the specific demands which the given sport requires of an athlete and thus stimulate the development of a specific training level. However, their share in the training (as to the relative share of the general expenditure of training time) is relatively low. This is explained, mainly, by the two circumstances: significance of functional shifts in an organism caused by the competitive exercises and by the non-expediency of their frequent repetition without preparation, which must constantly create prerequisites for the improvement of the qualitative and quantitative characteristics of the competitive actions (otherwise, repetition will not yield the desired effect—in the best cases, an athlete will only consolidate what he has already gained).

Competitive exercises are reproduced during training with certain deviations from what they look like during competitions. There may be different reasons for this. In some cases the intentional deviations are caused by a desire to improve the competitive actions already mastered, as

required by a new sporting result, or so as to avoid unnecessary motor stereotypes becoming habitual. In other cases, deviations are preconditioned by the impossibility fully to foresee and reproduce during training all the specifics of the actions on the forthcoming competitions, since they will occur as the result of changing situations, a thing typical for sports games and encounters. The training forms of the competitive exercises with specialisation in such sports are distinguished by great variety.

Special-preparatory exercises. They include the elements of the competitive actions, their variants, as well as the actions essentially similar to them in form and character of displayed abilites. For instance, a runner during training runs distances chosen for the coming competitions with increased speed (relatively to competitive speed achieved) or with a greater volume of work; a gymnast executes the elements and movements of the competitive combinations; players imitate exercises based on the elements of the game actions and combinations. Another example of the special-preparatory exercises are the imitation exercises, i.e., exercises which approximately recreate this or that peculiarity of competitive actions (skiers running on roller skis, divers and gymnasts exercising on the trampoline and with skipping ropes, etc.). In definite cases exercises from related and kindred sports like running the distances related with the competitive one also belong to the special-preparatory exercises.

It must be emphasised that an exercise can be regarded special and preparatory only if it has a general relationship to the selected competitive exercises. The composition of the special-preparatory exercises is decisively determined by the specifics of the selected sport. Therefore, the range of these exercises is relatively limited.

On the other hand, the special-preparatory exercises are not fully similar to exercises selected for specialisation (otherwise, there would be no reason to resort to them). They are created and selected so as to ensure action more selective and more significant for certain parameters of training loads than competitive exercises as a whole. For instance, executing the special-preparatory exercises of the type of pulling or crouching with weights, a weightlifter can overcome a much greater external load than at moments of

the classical dual event and thus create conditions for a more effective influence on the development of his strength. In the same way, a runner with a corresponding selection of special-preparatory exercises of a cyclic character shows greater speed or performs more work in volume than when he runs his competitive distance. One of the main purposes of the special-preparatory exercises lies, moreover, in outstripping the model of new (which have not yet been mastered) versions of competitive actions, i.e., timely creation of prerequisites of mastering the perfected forms of sporting technique corresponding to a new level of sporting achievements.

Special-preparatory exercises are divided into p r e l i m i n a r y exercises, aimed at mastering the forms of movement, and d e v e l o p i n g exercises to improve physical qualities (abilities). Such a separation, of course, is largely conditional, because the form and content of the motor actions are indivisible. But it makes sense even if the preliminary exercises are closer in form to the technique of the selected sport, while the developing ones are linked, as a rule, with more considerable training loads. Moreover, both exercises are introduced at the various stages of training in unequal ratios.

General preparatory exercises. Included in this group are exercises which represent the main practical means of the general training of an athlete. Their composition, as compared with other groups of training exercises, is in principle broader and more varied. Exercises both partially coinciding as to the peculiarities of their effect with the special and preparatory exercises and considerably differing from them (including those contrary directed) can be used as general preparation. The possible list of these means is theoretically unlimited. Practically, however, it is limited by time which can be taken from the general preparatory exercises without any damage to other means of training, as well as by the material and technical conditions of the training sessions (equipment, gear, etc.) and other circumstances.

When selecting general preparatory exercises, it is important to observe in equal measure the following two requirements: first, the general preparedness of an athlete must include a comprehensive physical education. In particular, exercises are needed which have a sufficient effect on the

development of all the man's physical qualities and enriching the store of vitally important skills. Determining the content of the general preparation in the Soviet sports school, it is essential to proceed, first and foremost, from the aims of the preparation for actual practice. Therefore, other conditions being equal, preference must be given to those exercises which are more valuable in this respect (in particular, to exercises included in the Prepare for Work and Defence complex). Second, the content of the general training of an athlete must reflect the peculiarities of the sporting specialisation. In the process of the development of the degree of training between its various aspects, or to be more precise, between various trends of the adaptive process, not only positive but also negative effects may arise (so called negative "transfer" of skills, qualities and training level). In this connection it is necessary to specialise the composition of an athlete's general training so as to use a positive "transfer" of the training level more fully and possibly to exclude or weaken the effect of the negative "transfer". As a result, the content of the general training of an athlete assumes this or that peculiarity conditioned by the demands of the sporting specialisation.

In the process of training the general preparatory exercises have several functions. They are used a) to form, instill or restore the skills which play an auxiliary-assisting role in sporting perfectioning, i.e., those which serve as "building material" for the technical and tactical skills of the sport selected for specialisation, help to hone them (by the mechanism of the positive "transfer" of skills) or are necessary for a rational performance of the exercises aimed at the development of physical abilities; b) as a means of fostering abilities insufficiently developed by the selected sport, enhancing the general level of work efficiency or maintaining it; c) as a factor of active rest, helping the rehabilitative process after considerable specific loads and countereffect of monotony in training. These functions determine the place of general preparatory exercises in the system of an athlete's training.

The characteristic of the three groups of exercises (competitive, special-preparatory and general preparatory) shows that alongside the distinctive peculiarities they are united by this or that degree of similarity with the selected

sport. There are some exercises which occupy a border position, combining in them the indicators of related groups. To these belong mainly exercises, the motor operational basis of which is similar to the selected sport, but differing from it by the regime of functioning of the organism or by the method of performing actions (for instance, with a swimmer—swimming in a non-competitive way and in non-competitive regime, with divers—jumps performed by various methods). Such exercises are like intermediary ones between the special-preparatory exercises and general preparatory exercises. They allow a close interrelation of the general and special training of an athlete and, therefore, occupy an important place in the training, especially of athletes of high qualifications.

2.1.2. Methods of Strictly Regulated Exercises, Game and Competitive Methods

The methods of sports training, based on the athlete's motor activity, may be subdivided in the first place into the methods of strictly regulated exercises, competitive and game methods. Since these methods are discussed in their general aspect in the theory and methods of physical education, here their peculiarities in sport are noted only in brief.

Methods of a strictly regulated exercises. The main trait of the given method is in the strict order of actions of an athlete who executes exercises and in a sufficiently accurate regulation of the acting factors. This is expressed:

—in a possibly full correspondence of the operational basis of an exercise (movements and actions) of the given programme (conditioned composition and sequence of actions preconditioned beforehand, the order of their repetition, changes and links with each other);

—in a possibly precise rating of the load and control over its dynamics in the course of an exercise, as well as in regulating rest intervals and the order of their sequence with load phases;

—in creating optimal external conditions facilitating the achievement of the desired effect of an exercise (use of training apparatus, training stands, elimination of the external hampering irritants, etc).

The essence of such a regulation is understandable: all this ensures strict control of the training effect. The methods of strictly regulated exercises are used in different variants depending on the tasks and conditions of their solution in the process of training. They can be grouped according to several indicators, each of which is essential in definite situations:

a) by the specifics of the approach to mastering the structure of an integral action there are methods of a broken-down-constructive exercise (when the action is mastered, first of all, in its broken-down form and then as a whole) and methods of an integral exercise (when the action is mastered as a whole with minor simplifications and the details are perfected against the background of the entire exercise);

b) by the degree of selectivity of the effect on the organism's functions there are methods of a selectively directed exercise (the influence of which can be concentrated preferentially on certain functions, for instance, on the functions of the aerobic and anaerobic exchange) and methods of generalised exercise (with the general influence on the complex of this or that athlete's ability);

c) by the degree of modelling (approximated reproduction in the process of training) of the basic peculiarities of a competitive activity. there are methods of a partial modelling and methods of the wholly approximated modelling of a competitive exercise*;

d) by the degree of standardisation or varying of the training influence there are methods of a standard repetative and methods of varyative (variable) exercise;

e) by the indicators of discretion (discreteness) or continuity of a load in the process of an exercise there are methods of an interval exercise (in which the load is broken, and is alternating with rated rest intervals)

* The term "modelling" is appropriate here since it denotes a somewhat altered and approximate imitation in training of future competitive actions, which the athletes perform in the "final form" in forthcoming competitions. This is not a copy of the learned competitive action but an imitation of its desired future form.

and methods of a continuous (permanent) exercise (in which the load within the framework of each separate case of the use of this method is not broken by rest intervals).

The chosen indications, although they do not exhaust all possible grounds of classifying methods of exercises, generally allow the making of a preliminary notion about their diversity in sports training. In the subsequent sections of the course they are discussed on a concrete basis as applied to the peculiarities of the methodology of the physical, technical and other sections of an athlete's training.

Competitive and game methods. The actions and general line of an athlete's behaviour during a competition or a game, as is known, are largely determined by the competitive and game situations, and this fact, above all, preconditions the differencies between the competitive and game methods and the methods of a strictly regimented exercise.

The actions during a game are organised on the basis of a play situation (the intention and the rules of the game), in which the final aim is achieved by many (in any case, by several) allowed methods in the conditions of constant and to a considerable degree chance changes of the situation, opposition and interaction of players. This limits the possibility for strict prescription of a plan of action (a preliminary programming of actions is highly improbable), precise rationing of loads and, therefore, control of the training effect. Alongside this, game activity, distinguished by a high emotionality, calls for an ability to control one's emotions and actions (especially in the so-called stress situations) and requires composure, initiative, persistence, flexible thinking, perfect coordination of actions and other abilities, thus presenting broad opportunities for instilling them.

That's why the game method finds a broad use in training athletes, and not only those representing game sports. The training process does not necessarily use sports game material (i.e., in the form of generally recognised games), but specially evolved preparatory games material (for instance, in basketball or handball the kind played according to simplified rules and supplemented by additional action taking into account the peculiarities of the chosen sport). The elements of the game method may be combined

with certain preparatory exercises, running and walking alternatively, for instance.

A rationally organised process of competition makes up the basis of the competitive method with an athlete competing not only with other athletes, but also with himself, trying to better his own sporting result in the preparatory exercises.

Methodologically, it is essential that the same form of exercise, executed competitively or in other conditions, carries with it, in the first case, a higher functional value to cause a deeper functional shift of a psychological, physiological and biochemical character. If an athlete is prepared for such loads, competitions, in their turn, may serve as an effective factor for further training since they play an indispensable role in the development of a specific degree of training, perfectioning of skill and the instillation of sporting character. This explains the inclusion of the competitive method into the training process.

The competitive method, coinciding in a number of indications with the game method and together with it, acquires certain traits of a strictly regulated exercise (precise unification of the pattern of actions, sequence of their execution, the method of evaluating the result and determination of winners, etc.). In the process of training it is presented both in its elementary form (short-time trails for the quality of execution of individual movements, including purely preparatory and so on), and in the form of semi-official and official competitions which are given, mainly, a preparatory character (control, classification, selective competitions, etc.).

2.2. General-Pedagogical and Other Means and Methods of Sports Training

Many general-pedagogical and special means and methods used in sports training are included in the system of an athlete's training as part of a system of exercises, making up a specific basis of the training process. They are used by the coach or the athlete himself and besides the factors relating to the training content include certain additional factors which enhance its effectiveness.

Means and methods of the oral, visual and sensory-correc-

tive effect. As in any other pedagogical process, the leading role in sports training belongs to the teacher–coach. To supervise the training activity of an athlete the coach uses, first and foremost, methodologically worked out forms of oral intercourse, persuasion, impression, explanation and control. It is well known that the role of the word of a teacher is exceptionally important and multi-sided. With his voice the coach influences all aspects of an athlete's activity in a training process.

The selection and method of using the word depends (above all other things) on the logical and specific peculiarities of a training process. Some general methods of oral control assume here unique forms conveying the meaning and issued in laconic form, a fact which ensures the necessary motor density of training sessions. To this methods, in particular, belongs a precise and capacitive briefing before carrying out assignments, accompanying explanations, given during exercises or in the intervals between them, instructions and commands, remarks and oral appraisal of an encouraging or corrective nature.

To induce maximum demonstrative and trustworthy confidence when setting and carrying out assignments, and in analysing actual results of execution, in addition to the traditional means of visual teaching (natural demonstration, demonstration by visual aids, etc.) modern sports practice increasingly uses special means. They are aimed not only at forming visual perceptions but also ensure a demonstrative effect in the broadest sense of the word (such as the directed effect on all organs of feeling taking part in controlling movement), give objective information about the parameters of the actions being executed and facilitate their correction in the process of execution. Thus, resolving the tasks of technical, tactical and physical training, the following means and methods are used in particular:

–means of cinecyclographic and videotape demonstration (demonstration of standard short films with the recorded technique of sports movements);

–methods allowing to get the "feeling" of the movement connected with the use

of special training stands (for instance, gymnastic training stands with mechanical device, imparting the direction of rotation, pendulum training stands which give the feeling of the dynamics of the effort in shot putting);

–means and methods of the selective demonstration, orientation and pacing (recreation of the spatial, time and rhythmical characteristics of movements with the help of electronic and mechanical apparatus, allowing a perception of them visually, audibly or tactily; introduction into the situation objective and other bearings; executing exercises to a sound or light pacer and so on).

The search of ways for optimal control of the process of sporting and technical perfectioning and the effect of training loads has led of late to the evolvement of new technical means and methods of their usage, taking in ideas of automatic control of the parameters of movements and individual functional shifts in the course of an exercise, prompt sending to the athlete of control data in a signal form and of correcting, on this basis, actions performed by him. Certain methods of express information and their mechanical paraphernalia can serve as examples here (prompt signalisation of violations of movement parameters, supplied by special devices, which automatically record them); programming the regime of the execution of exercises by the frequency of the heart beat with the help of autocardio-pacers and a number of other means. Their arsenal will, undoubtedly, be replenished with the introduction into sport of new scientific and technological achievements, especially in the applied branches of cybernetics, bionics, the information theory, engineering psychology and electronics. There are every ground to think that in time a whole class of methods involving apparatus and automated (cybernetics) control of an athlete's motor activity will take shape and be introduced into sport. This, naturally, will not diminish the leading role of the coach in the training process. On the contrary, it will allow him spend more time and effort on the solution of a really creative tasks in coaching and upbringing of an athlete.

Ideomotor, autogenic and similar methods.* Special methods of directed use by an athlete of inner speech, figurative thinking, muscular and motor and other sensory notions for influencing his psychological and general state, regulating it and forming the operative readiness to perform training and competitive exercises make up this specific group of methods. Separate methods of this kind have long been included in sports practice. This is, in particular, an ideomotor exercise (mental reproduction of a movement while concentrating the attention on the decisive phases before actually performing the exercise), emotional self-tuning for a forthcoming action with the help of an inner monologue, self-ordering and other methods of self-induction and self-organisation.

In the last decade they were supplemented by the methods borrowed from the general psychology, medicine and psychohygiene and adopted to the specifics of sports activity.

Certain other factors pre-conditioning training effect. Besides the characterised means and methods, which in their totality make up the basic factors of the directed influences in the process of sports training, many accompanying factors are used in connection with it. Different in nature, they can hardly be presented in the logically strict classification. The general feature about them is that they all can be used in one way or another for ensuring an optimal training effect.

It is well known that the effectiveness of sports training depends to a considerable degree on natural conditions of the surrounding media. A number of natural conditions (such as solar radiation, oxygen content, atmospheric pressure, temperature, the dynamic effect of the air and water and so on), if their effect is regulated in accordance with definite rules, can rightly be regarded in a certain sense, as the natural-media factors of an athlete's training, which may have considerable influence not only on the condition of the current work efficiency of an athlete, but also on the dynamics of his

* The term "autogenic methods" in this case means methods based on use by an athlete of inner speech, verbal-figurative and emotional notions in order to tune oneself up for performing training assignments and for regulating one's condition.

training level. It is not accidental, for instance, that training in mountainous climatic conditions, which help to expand the functional abilities of an organism (especially, the so-called, aerobic abilities), today has become a component of the system of an athlete's training.

It is also known what an essential role the hygienic factors have in the general optimisation of training conditions. Many of these factors are compulsory and constant for use in training sessions (corresponding to the requirements of hygiene, the condition of sports facilities and places where training sessions are held, in general, their cleanliness, illumination, ventilation and so on). Part of the hygienic factors, used purposefully in the process of sports training or in direct connection with it may be used as a hygienic means of the operative influence on the dynamics of an athlete's work capacity (for instance, artificial aeroionisation, massage and other rehabilitating procedures in the intervals between the series of exercises or immediately after the end of the training session).

The training effect of exercises to a considerable degree depends on the conditions of their rational use. The material and technical means of sports training (sports training stands, specialised apparatus, control and information apparatus, etc.) also must be kept in mind among these conditions. The development of new technical means allowing the improvement of control of effective training exercises (as was shown above on certain examples) becomes one of the determining lines of the rational methods of training.

The desire to use comprehensively factors directly or indirectly boosting sports work capacity, expresses itself in the attempt to find specific psychological, biological and dietological means of influencing the functional abilities of the organism.

3. THE LOAD AND REST AS THE COMPONENTS OF THE SPORTS TRAINING

3.1. The Notion of a Training Load

To characterise factors influencing an athlete in the training process, the notion "training load" is used alongside

the notions *means* and *methods*. It emphasises an obvious fact that the performance of any training exercise is connected with the switching of an organism over to a higher level of functional activity than in the state of rest or moderate functioning and in this sense is an "addition," "loading" of the organism's organs and systems, causing fatigue if sufficiently great. Thus, the term "training load" means an *additional functional activity of the organism* (relative to the level of rest or other initial level), *introduced by the performance of training exercises, and the degree of difficulties which are being overcome in the process.*

Generally, the essence of "training load", has been long understood: causing the expenditures of work potentials of the organism and fatigue, it thus stimulates the rehabilitating process and as a result (if not to speak about excessive loads) is accompanied not only by rehabilitation but by super-rehabilitation of work capacity.

The theory and methods of physical education provide the general characteristics of loads while performing physical exercises. Here it is seen as applied to the specifics and indices of loads in sports training.

Bigger loads both in scope and in intensity are used in sports training as compared with the general forms of physical education. This is conditioned by a natural link between the level of sports achievements and load parameters. Although their interrelation is not always directly proportional, the general tendency is such that any increase of sporting achievements undoubtedly depends on an increment of training loads. Experience of the sports theory and practice proves this.

The level of training loads on the whole tends to increase as the athlete's degree of training develops. Within the limits of certain stages of training the loads are increased far from along a directly assending line. With due account of this there are loads of the developing effect proper (or training loads proper) which induce in the athlete's organism considerable progressive changes of the functional and structural character and the stabilising loads, the primary purpose of which is to instil and strengthen the adoptive restructurings achieved.

In connection with the difficulties of a generalised appraisal of training loads they are judged by the number

of individual indicators. Partially, the indicators relating to the external and internal aspects of the loads are distinguished conditionally. The first of them represent quantitative characteristics of the training work performed, evaluated by its externally expressed parameters (duration, the number of repetitions of training exercise, speed and the tempo of movements, the volume of the weight being shifted, etc.). The second of them, while expressing the degree of mobilisation of the functional possibilities of an athlete's organism when he performs certain training work, are characterised by the preconditioned by it magnitude of the psychological, biochemical and other functional states of the organs and systems (increase of the frequency of the heart beats, the volume of lung ventilation and use of oxygen, beat and minute blood prevolume, lactic acid content in blood, etc.).

Just as the external so the internal indicators of the load have their significance in its evaluation and directed regulation. The external indicators are important already because the coach and the athlete are being directly oriented by them, while they determine concrete quantitative parameters of the training assignments and exercises. They are constantly used in planning and estimating training work, as well as for comparing against them the reactions of the organism to a given training work. The indicators of the functional shifts in the organism help to determine an expedient measure of training loads, thoroughly evaluate whether they correspond (or don't) to the functional abilities of the organism and their effect on the development of the level of training. These two types of the indicators of training load cannot, therefore, be contraposed as mutually excluding. They must be distinguished and used as a unity.

In principle, there is no doubt that the effect of the training load depends both on external parameters, on vegetative shifts in the organism and on the coordination complexity and mental (emotional, in particular) tension of the exercises performed. True, the objective quantitative evaluation of such factors is difficult because the reliable methods of its obtaining are so far only at the stage of evolvement. In practice certain methods of evaluating loads are already used, which allow, in particular, a

rough notion about the mental tension connected with them (for instance, in the conditional rank, points, etc.) including an athlete's self-evaluation.

According to the existing notions, the volume of a train ing load derives from its intensity and volume. They may be simultaneously increased only to a certain limit, beyond which further increase of intensity will lead to a decrease in the volume and vice versa. Hence, the necessity to take into account the parameters of the volume and intensity of the load, their co-relation and changes in the training process.

The notion "volume" of a training load is related to the duration of its effect and the sum quantity of work done during a training exercise or a series of exercises (the term "work" here is understood not only in the physical and mechanical but also in the psychological sense). The notion load "intensity" is linked with the volume of the effort expended, intensity of functions and the impact of the load at every moment of the exercise or with a degree of concentration of the volume of training work in time (when characterising the sum total of the intensity of a number of exercises). The load volume and intensity in principle do not boil down to any one particular indicator, while the complex of possible indicators somewhat differs in evaluating the load in separately-taken exercises and in the sum total of various exercises.

The time needed to perform an exercise is one of the most frequent external indicators taken into account, in other words, its duration in time. The intensity of individual exercises is very often evaluated by the speed and tempo of movement, volume of the external burdens which have to be overcome and of similar indicators.

The fact that exercises which have the same basis—the selected sport, allowing to use commensurable indicators when making summary characteristic of the main part of the loads—make up a predominant part of its volume renders the obtaining of the generalised load evaluation in sport training somewhat easier. For instance, in all sports of the cyclic character kilometrage (or metrage) of distances, covered during a training session, is used as an external indicator of the training load volume and of the intensity—the speed with which they are covered. In weightlifting, correspondingly, the sum total of the weights lifted in the exercise with the dumbbells or absolute or relative weights in every exercise, etc.

The correlation of the load volume and intensity of certain exercises in speed indicators and the maximum possible time of their execution (or power and quantity of work) can simply be described mathematically or expressed graphically, as was done, for example, in *Fig. 3* A and B. Generally, the dependence between these aspects of the load is characterised, speaking in somewhat simplified terms, by the fact that the greater the exercise intensity, the lesser is its possible duration and vice versa, the greater the duration of a continuously performed exercise, the lesser its intensity.

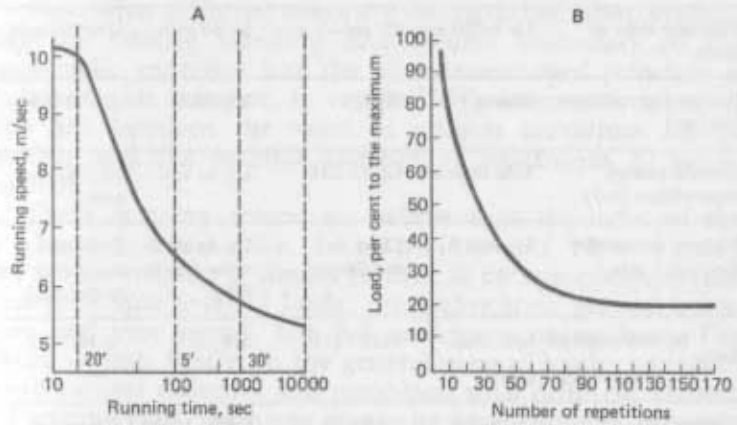

Fig. 3. **Correlation of the volume and intensity parameters in individual exercises:**
A—the diagram of the "speed-time" ratio according to the data of world running records (time scale is given in the logarithmic conversion); broken lines show time duration corresponding to the physiological zones of the "relative work power". *B*—the diagram of the "volume of burdens—the number of repetitions dependence".

However, all the possible correlations cannot be described accurately by one equation expressing the linear inversely proportional dependence. The speed/duration of motor action ratios (or power/duration of work ratio) changes

with the change of intensity as if by zones, which considerably differ one from another by physiological work characteristics. This served as the basis for the isolation relative to the cyclic exercises of the so-called "relative power zones"— the zones of the maximum, submaximum, great and moderate power. Some of the characteristics are given in *Table 4*.

Table 4

Certain Physiological Characteristics of the Cyclic Exercises of Different Relative Power (according to the generalised data of different authors)

Indicators	Zones of relative power			
	Maximum	Submaximum	Great	Moderate
Ultimate time of work	Up to 20 sec	20 sec÷5 min	5÷30 min	Over 30 min
Energy expenditure (cal/sec)	About 4	4÷0.5	0.5÷0.4	About 0.3
General energy expenditure (cal)	Less than 80	Up to 240	Up to 750	10,000 and over
Oxygen consumption per 1 min	Up to 1.5	Close to maximum	Up to maximum (up to 6-7)	Less than maximum (up to 5.2-5.5)
Ratio O_2 expenditure / O_2 requirement	Less than 1:10	1:10÷1:2	3:4÷5:6	9:10÷1:1
Oxygen debt (O_2 l/min)	Up to 20	Up to 25	Up to 15-16	Up to 4-6
Lung ventilation (l/min)	Less than 60	150-200 and more	100-150 and more	Less than 100
Frequency of heart contractions per minute (beat per min)	By the end of an exercise 185 and more	Up to 240	Up to 220 (mainly less)	Up to 180 (mainly less)
Minute blood volume (l/m)	Less than maximum	Approaches to maximum	Maximum or close to it (up to 35-40)	Less than maximum

Continued

Lactic acid content in blood (mg, percentage)	Up to 100	200-250 and more	100÷50	At the beginning raises insignificantly, then approaches to the initial level
Sugar content in blood (mg, percentage)	Normal or increased to 80-120	Normal or increased	Normal	Lowers towards the end of work

Note: 1. Maximum volumes are given as applied to the record results and are calculated, as a rule, on the basis of an indirect (laboratory) data.

Somewhat different zones are distinguished when evaluating the relative intensity and volume indicators of the non-cyclic exercises but the above-mentioned principle is retained (for instance, in weightlifting account is taken of the link between the value of weights maximum for an athlete and the possible number of repetitions of movements).

There is every reason to believe that the ratio of the volume and the intensity of the total load in training is similar to that in certain exercises (the less their sum total of loads, the higher their general intensity and vice versa), but full analogy is unjust here. The thing is that, firstly, in the general mass of loads connected with various exercises and combined with different volume of rest intervals, there can always be a multitude of concrete variants of the relation of certain parameters of volume and intensity; secondly, when planning a training session the entire range of the possible values of the load volume and intensity (from minimal possible to the maximum) is practically never used in equal degree. As the generalisation of a practical experience shows, the loads with an intensity less than 30 per cent of the maximum occupy a relatively small place. The main load volume has a 60-80 per cent intensity (although there are also other variants conditioned by the specifics of various sports). Infrequently, the distribution of the sum volume of the main training loads over the intensity zones reminds us of the so-called normal

statistical distribution or approximates it (*Fig. 4*). The problem of the volume/intensity ratio and of the expedient dynamics in the training process is a subject of a special discussion in the following sections of the course.

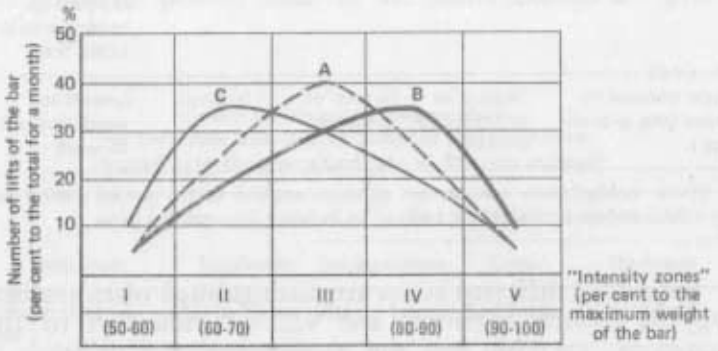

Fig. 4. **Examples of the distribution over the "intensity zones" of the total load volume in exercises with the bar performed during the monthly training cycle (by the indices of the total number of lifts):**

horizontal line—"intensity zones" in percentage of the maximum weight of the bar lifted by the athlete. Vertical line—total number of lifts in each zone expressed in percentage of monthly lifts; *A*—curve similar to the statically normal. *B*—curve with shift to the zone of a heightened intensity. *C*—curve with a shift to the zone of a relatively low intensity.

3.2. Rest as a Component Part of Sports Training

The training process, as is known, includes rest. But rest can be regarded as a truly organic component part of training only when it is organised in correspondence with its regularities. An excessively brief or on the contrary, excessively prolonged rest violates the training structure and turns in such cases into a factor of overtraining or detraining. Hence arises the problem of the optimal regulation of rest in sports training.

Rationally organised rest (active or passive) has two main functions in training: 1) it ensures the rehabilitation of

work capacity after training loads and thus allows their repetition; 2) it serves as one of the means of the optimisation of the load effect. The perfectioning of the methods of sports training follows a path of the more rational use of both these rest functions.

As a rehabilitating phase rest in the training process is rationalised with the help of such means as the use of its various forms (including the shifting over to another form of activity from the one that caused fatigue); combining variants of active and passive rest; introducing in intervals between a series of exercises elements of psychoregulating training aimed at calming and toning-up an athlete, rehabilitating massage, thermal treatment (for instance, brief warming in the sauna in the intervals between swimming exercises), other hygienic treatment, etc. The complex of special factors of speeding up the rehabilitating processes is being increasingly replenished in modern sport in connection with a sharp increase of the volume and intensity of training loads. Account must also be taken of the fact that the essense of the optimisation of rest in training does not by far boil down to ensuring a possible quick and full rehabilitation of work capacity in the intervals between exercises. This is necessary only in certain situations (for instance, when mastering new coordinationally complex forms of movements or instilling speed abilities). The direct aim of training is not rest but the achievement of the optimal training effect. The dosage of rest is subordinated to it.

The use of rest as a means of optimisation of the effect of training loads is based on the fact that on its duration in the intervals between exercises and specifics of its content (active or passive) depends the "consequence" of the previous load and the effect of that following. It is known that a sufficiently brief rest interval or a "rigid" interval intensifies the effect of the next load, since it coincides in phase of an incomplete rehabilitation of work capacity and residual functional activity from the previous load. Rest sufficient for a simple restoration of work capacity to the initial level, or an "ordinary" interval, allows the use of repetitive loads without decreasing them but also without increasing the parameters. Rest creating the conditions for a "super-

rehabilitation" of work capacity, or "maximising" the interval allows an increase of the next load. The degree of mutual superimposing of load effects, however, may be decreased. These dependencies are described in general in physical education theory. In planning a training session coaches pay to it particular attention, because on the whole a packed regime of loads and rest is characteristic of it. In a number of methods (methods of interval training) decreasing and very rigid rest intervals are used. Such intervals are calculated for the superimposition of the effect of the recurrent loads with strict account of the functional shifts taking place in the organism during the intervals.

4. THE GENERAL STRUCTURE OF THE TRAINING PROCESS; ITS LINKS WITH THE EXTRA-TRAINING FACTORS AND THE CONDITIONS OF THE SPORTING ACTIVITY

4. 1. The Tentative Structure of the Training Process

All the elements of the content of sports training, the means and methods and other components are interrelated as parts of aspects of a single whole.

An aim of an athlete's activity in training directly depends on a precise setting of the task for each training session.

Training sessions are singled out as structural and integral and at the same time as relatively elementary links of the training process. Each one of them is a systematically organised aggregate of the training exercises, other means and methods of an athlete's training, directed at carrying out a particular training assignment. As a relatively separated part of the training process, separate training sessions are practically detached from others by a rehabilitating rest (always more lengthy than the rest intervals between the exercises during the session) and extra-training forms of an athlete's activity. The duration of intervals between training sessions depends first of all, on the general regime of the life activity of an athlete, conditioned, in its turn, mainly, by the basic extra-training activity (study or work), its content and the necessary time expenditure; secondly, on the time necessary for the rehabilitating processes; and,

thirdly, on the terms which are needed to ensure optimal succession of the training effects of the previous and consecutive sessions.

The term "training effect" is used for the most general designation of those changes in the organism being the consequence of training sessions. In actual fact it happens to be very different depending on the initial state of the organism, content of the sessions, specifics of the use of the means and methods, time passing between the sessions and other circumstances. To understand the order of "deployment" of a training process in time (its time structure) it is especially essential that the training effect, achieved as a result of each separate training session and the system of session as a whole, does not remain constant. It changes as a result of a mutual superimposing (cumulation) of the effects of the previous and consecutive sessions. At the same time it changes depending on the duration of the intervals between training sessions. In other words, the training effect is not only the consequence of the training sessions, but also a function (dependent variable value) from time between them. In this connection we must distinguish as a minimum "immediate", "delayed" and "cummulative" effect of training.

An immediate training effect covers the shifts in the condition of the organism at the end of this session (or its parts). If the training load of the given session was sufficiently great, the immediate training effect is characterised by the decreased level of work capacity, by this or that degree of the exhaustion of the organism's power resources, by predominance of the dissimilation in the metabolism processes, etc. But it never boils down only to such phenomena. It is characterised at the same time by the functional activity of the organs and systems ensuring the development of rehabilitating processes (oxygen supply, elimination of lactic acid in blood, etc.), formed coordination links, which are a component of the acquired or being acquired skills and others shifts important for the futrher development of the training level.

The delayed training effect of an individual session is

what the immediate effect is being transformed into depending on the time elapsing before the next session. By the general notions of rehabilitating the work capacity it can be, in principle, of three kinds:

–the delayed effect of the first kind is characterised in a generalised form by the under-rehabilitation of the work capacity: having been lowered due to the training load, it is just beginning to reach its initial level (from which the training session began); particular indicators here again may be varied (under-rehabilitation of energetic resources, residual activity of metabolism, etc.). When planning a training session with the use of such an effect, relatively short and rigid rest intervals between the training sessions are kept. This leads to the increase of the functional shifts from session to session (*Fig. 5*).

Fig. 5. **Diagram of one of the variants of the "summation" of the effects of several training sessions.**
MC–microcycles: dark rectangles–training sessions the effect of which is intensified thanks to "rigid" rest intervals; hatched rectangles–sessions, mainly, of the rehabilitating nature; wavy curve conditionally shows the work capacity dynamics (unit–initial level).

–The delayed training effect of the second kind is connected with practically full "simple" rehabilitation after the training session to the initial level ("simple" in the sense that it allows to repeat the work performed without a substantial increase of its volume and intensity). When planning a training session with the use of this effect, "ordinary" rest intervals between training sessions are observed. This allows to fix and consolidate a number of positive consequences of the training session (coordinating links lying at the basis of the formed or being formed skills, certain adaptive restructures of the morpho-functional character), but does not guarantee a considerable

increase of training loads.

–the delayed training effect of the third kind is expressed in the phenomenon of the "supercompensation", "superrehabilitation". This allows the conduct of current training sessions with an increase of the quantity and quality of work. This effect is thus linked with "maximised" rest intervals.

When planning the system of training sessions, use is made, as is obvious from the aforesaid, of the delayed training effect of all the three kinds along with introduction between the sessions of rest intervals of different types (rigid, ordinary and "maximising"). Each of them conditions the general effect of the training session in its own way and in combination with others is used for optimal control of the development of the training level of an athlete.

Cumulative training effect is the result of the combining of the immediate and put off effects of training sessions, embodied in acquiring or improving of the state of training which is based on more or less essential adaptive restructurings of biological structures and functions of the organism. The degree and direction of these restructurings depend on the general content, specifics of planning and duration of the stages and periods of the training process. Hence the cumulative effect of training may be different: when the content of training is sufficient and it is well planned, it is characterised by steadily growing (with every new stage) level of training, while chronic flaws in training may lead to an opposite cumulative effect–"overtraining". This poses an important problem of the theory and methodology of sports training–the optimal control of its cumulative effect.

Analysing the links between the training sessions and their effect, it is of principal importance to have in mind that any training effect is not a mechanical consequence of training. Man's organism as a self-regulating and self-developing system does not simply reflect training effects but actively reacts to them (more so when the influencing factor, as in the case examined, is the activity of the organism itself) and converts their effect according to the regularities of its functioning, adaptation and development. In fact, these regularities are part of the

content of the basic objective links which make the training effect indirect and internally condition their overall effect. It is clear that rational training cannot be planned regardless of the inner response reactions, of the interaction of fatigue and rehabilitation, of the transition of immediate training effects into delayed ones, of delayed ones into cumulative and so forth—all these regularities make up a natural basis of planning. The examined links are, therefore, not one-sided but mutual. Their totality forms the sphere of manifestation of a number of regularities of sports training.

If the training process is examined as a whole, we must go over to its bigger and more complicated structures than that relatively small fragment which has so far been examined. For introductory characteristics it would be enough only to designate them. Here it is important that the content and the form of planning training sessions in the course of the training process regularly change and at the same time retain recurrent traits over a definite period of time. A number of training sessions making up a relatively complete recurrent fragment of the training process forms a **training "microcycle"**. Infrequently its duration is about a week (including intermediate rest days), but not always. As a minimum, it consists of the two training sessions of different types. The aggregate of several microcycles mainly of one type makes up an **average training cycle ("mesocycle")**. Its duration is close to one month (but again not always). The system of average cycles of different types, alternated by the regularities of the long-term training process, makes up the basis of the structure of annual, semi-annual or the cycles close to them in duration—**training "macrocycles"**. Each such cycle consists, as a rule, of three periods: preparatory (period of fundamental preparation), competitive (the period of the main competitions of a cycle), and transitional, regularly connected with which are the phases of the development of the sporting form as a condition of the optimal preparedness of an athlete for sporting achievements. Twelve and six-month cycles make up stages of a many-year training of an athlete. Special sections of this course are devoted to the characteristic of the determining traits of planning a training session in its small, average and big cycles.

4.2. The Links of Sports Training with the Extra-Training Factors and Conditions of Sporting Activity

Sports training can be separated from the aggregate of various factors and conditions influencing the growth of an athlete's achievements only abstractly. In the language of the theory of systems, sports training is related not to "closed" but rather to "open" systems, the content and the form of which depend largely on external factors. When defining the notions, it has been stressed that sports training is especially organically linked with the system of competition and with a number of extra-training and extra-competitive factors of an athlete's training.

The system of sporting competition includes, as is known, a number of official and non-official competitions which have their own independent significance: sporting-proper, preparatory, classification, promotional, etc. Official competitions are planned within the framework of a single sports calendar (general for a certain contingent of athletes). An individual calendar of competitions is drawn up in conformity with it and to the specifics of training for this or that athlete. Practically, it always differs in this or that detail from the main calendar and largely depends on the logics of the training process.

Competitions of the highest rank (absolute competitions in sports, championships, spartakiads or olympiads with an overall team scoring records and so on), most significant both in the individual and social respect, occupy a predominant place both in the general and individual calendar of competitions. Thus, the main or special competitions have a particular effect on the organisation of an athlete's training and the terms necessary for arriving at optimal preparedness for achieving a high sporting result and separate training stages are planned as applicable to them. Most other competitions are to a considerable degree preparatory, although their concrete tasks may greatly vary (testing the preparedness, amassing competitive experience, selection to a national team, etc.). As such, preparatory competitions are an organic part of the system of training an athlete and are subordinated to the regularities of planned training.

The system of the extra-training and extra-competitive factors of training an athlete includes special measures for the speeding up of the rehabilitative process after training and competitive loads (sports-rehabilitative factors, specialised hygienic, psycho-hygienic, physiotherapeutic and other treatments, specialised nutrition, vitaminisation, and so on), as well as special factors used to intensify or supplement the effect of training loads (natural and artificially created factors of the external media, additional biological means of enhancing sporting work capacity, etc.), as well as broader-than-training forms of education and self-education of the athlete and many other things.

Partially, as has already been mentioned in the general review of the means of training an athlete, these factors are used in the process of training. They merge with the athlete's general conditions of life and activity including his regime of work and everyday life, socio-hygienic conditions, and the entire system of education in a society. Just how great is the influence of all these general conditions on the effectiveness of sports training is understandable. It's on them, besides everything else, that time allotted for sports activity and an opportunity to engage in sport, depends.In its turn, sport becomes an organic part of the life and activity of an athlete, it has a more or less essential effect on his general regime: it is organised to this or that degree applicable to the requirements of sporting activity. These interrelations have to be constantly remembered when going deeper into the problems of sports training they will be selectively examined as a separate object of analysis.

Chapter Three
General and Special Principles Realised in Sports Training

1. THE IMPORTANCE OF GENERAL PEDAGOGICAL PRINCIPLES AS STARTING POINTS IN THE COACH'S ACTIVITY; THE PROBLEM OF SPECIAL PRINCIPLES OF SPORTS TRAINING

In the theory of sports training as in any other scientific and practical discipline, dealing with the problems of teaching and educating, the definition of opening theoretical and methodological propositions—principles which would reflect in a generalised form the main regularities in the given sphere of the practical activity and on their strength can serve as a guide to action, is given prime importance.

In special literature on sports training a sufficiently great number of principles is being formulated. Often mentioned among them are well-known didactic principles (teaching principles), principles of methodological physical education and certain other general and special propositions, very often the list of them differ with different authors. This may give an impression that the initial propositions of the theory and methodology of sports training have not been sufficiently developed and brought into order which to a certain degree is quite true because the theory of training is very young as a science, while the problems of scientific development of the principles are extremely difficult. However, it would be wrong to think that modern sports theory is only at the approaches of development. If we detach ourselves from external differences then behind the varied formulations we can discern an undoubted common interpretation of the essence of propositions which are of primary importance for the theory and practice of sports training.

The general pedagogical principles are, above all, applied to sports training as to a pedagogically-organised process, because the general initial propositions, true for any educational activity, are concentratedly expressed in it.

No matter what the specifics of sports training are, they cannot serve as the reason for deviation from the fundamental pedagogical propositions—such as the principle of combining in education exactness and respect toward a personality, upbringing in a collective and labour for the common benefit, with due account of the age and individual differences of the charges, the principles of awareness and activity, graphic example, systematic approach, etc. The coach, if he is a true teacher, constantly takes guidance in his work from all the general principles of teaching and educating, creatively applying them to the specifics of sports training and to pedagogical situations developing in the process. Thus, the initial propositions of the coach's activity in fact do not differ from the principles of activity of any other teacher.

The general pedagogical principles are general precisely because they do not identify the specifics of sports training. Therefore, they do not exhaust the entire system of principles to guide the coach's activity. **The principles formulated by the theory and methodology of physical education** have an essential significance here. Reflecting the regularities of physical education, these principles are directly related to sports training. They bind general pedagogical propositions with those expressing general specifics of any rationally-patterned process of physical education, sports training included. The principles of the comprehensive development of a personality, applied-work, defence and health purposefullness of physical education, as well as the methodological principles of physical education fully extend to an athlete's training and once again in relation to it they are not special but general.

The problem of special principles of sports training arises so far not only as general but also as specific regularities objectively adherent to it. They present internally necessary essential links in sports training, determining its dynamics and pattern. These, in particular, are regular links between the training actions and their effects, between the various components of the content of sports training, between the phases of the training process and the course of the development of an athlete's degree of fitness. It becomes clear from this that the evolvement of the principles of sports training lies in the final analysis in identifying its objective regularities.

Although it is always a person who organises sports training, it would be wrong to regard it as a product of subjective creativity. Regularities, the existence of which does not depend on our wishes, is an objective determining foundation. The principles, if they correctly reflect objective laws (and only in this case!) become the most important propositions, indicating the way and the main conditions for achieving the goal. Such an outlook on the essence of the principles of sports training irrevocably results from the main methodological positions of a scientific world outlook. "The laws of the external world, of nature,... are the

bases of man's *purposive* activity."*

Inquisitive thought of many researchers and men of practice revealed many essential links and relations, determining the results of a training process. True, far from all of them can be described at present in a strict form of regularities and precisely formulated in the form of the main principles of sports training. Therefore, the propositions expounded here are to a considerable degree preliminary, work character. The work initiated at present in research laboratories in the perspective will, undoubtedly, allow to present more fully the entire system of sports training and the principles reflecting them.

2.CERTAIN REGULARITIES OF SPORTS TRAINING AND THE PRINCIPAL PROPOSITIONS BASED ON THEM

2.1. Direction at Maximum Achievements, Intensified Specialisation and Individualisation

The analysis of the essence of sport characterises it as an activity inseparable from the orientation to high achievement. Besides personal motives such an orientation is facilitated by the social significance of sports achievements, direction and organisation of the sports movement in a society (the system of sports competitions, the system of progressive encouragement for high sporting results in proportion to their level—from awarding an initial sports rating to the national honouring for outstanding sports results, etc.).

Generally speaking, the moment of achievement is inherent in most kinds of man's activity. However, as distinct from the kind of activity which envisages only a certain far-from-maximum possible degree of the achievement, sport is aimed objectively on the whole at the maximum possible results. And although this maximum differs individually (with some it is only a personal record, with others—an absolute result), regular is the desire of every athlete to go along the road of perfectioning in sport as far as possible. It is quite obvious that such an orientation is

* V. I. Lenin, "Conspectus of Hegel's Book the *Science of Logic*", *Collected Works*, Vol. 38, p. 187.

realised depending on individual sporting talents, many years of engaging in sport and by a number of other circumstances. In the first stages the orientation towards highest achievements has a character of a perspective goal. Then it is being realised stage by stage in an accessible measure until the age and other limiting factors begin to operate.

The direction towards maximum achievement is objectively linked with an athlete's increasing creative activity on the road to ever new results. This, as it has already been stressed, conditions sport's exceptional effectiveness as a factor of development of certain of man's abilities. Such a direction predetermines in any event all the distinguishing features of sports training expressed in the specifics of its content, means and methods, the dynamics of training loads and in the patterning of the training process.

The setting at the highest sports achievements and objective conditions of its realisation predetermine sports specialisation. It is characterised by such a distribution of the time and strength in the process of sports activity which is most beneficial for perfection in the selected sport (or in a few related sports), but is not such for the highest results in other sports. Along with the increase of the general level of achievements in modern sport, specialisation becomes especially deeper. If not so long ago attempts were undertaken to combine high results into two and more different sports (especially in seasonal sports such as, for instance, skating and cycling, skiing and rowing, soccer and ice hockey), today one comes across such cares only as exceptions. Moreover, narrow sports "specialities" began to be separated in skating, skiing, wrestling, fencing and in others, with the representatives of the same sport (defenders, half-backs, forwards) developing their "functional" specialisation. Deepening of one's specialisation undoubtedly enhances the growth of sporting mastery.

Having in mind all this as the principles of sports activity and, therefore, the principles of sports training, the "principle of achievement" and the "principle of specialisation" are moved forward, or to be more exact, the "principle of maximum individual achievement" and the "principle of deep specialisation". **The principle of maximum individual achievement** emphasises that regular for sport as a whole (sports training included) is a desire to identify

more fully an athlete's strength and abilities in the form of results and to ensure the conditions for their maximum development. It may not necessarily be expressed in absolute records. The social and educational aim of sport is achieved when an athlete develops his abilities sufficiently fully achieving results within his reach.

At the beginning of the '20s the Soviet researcher V. Gorinevsky demonstrated the importance of **the principle of the deep sports specialisation.** "One cannot be a general purpose athlete, i.e., love and engage in every sport without discrimination. Such a universality is nothing but diletantism, which does not allow individuality to be fully realised." This principle shows that the concentration of time and strength on any one selected sport is an objectively necessary condition for achieving high results. The realisation of such a principle in sports training presupposes a strict correlation in it of special and general preparation, as well as a number of other specifics of planning of the training process which will be discussed later on.

The principle of deep specialisation in sport is directly linked with **the principle of deep individualisation.** Sports specialisation conducted with due account of individual abilities of an athlete allows to realise his abilities more fully in sport and satisfy his sport interests. But this is true exactly when specialisation corresponds to individual qualities of an athlete. Erroneous selection of a subject of specialisation which does not answer individual abilities, may reduce to naught the efforts of the athlete and his coach, lead to disillusionment and to premature cessation of the active sports activity. Hence it is quite clear what a responsible role timely diagnostics of individual abilities play. Today serious attention is paid to this problem in sport.

The special significance of the principle of individualisation in sport is also determined by the use of greater loads which very often approach the functional abilities of an athlete's organism. The principle of individualisation demands that in a sports training the increase of the loads strictly correspond to the functional and adaptive abilities of an organism with due account taken of the individual differences of tempo of the development of the level of training. The thing is that due to the individual differences of the organism's adaptive abilities the same external loads

can have quite different consequences. This must be reflected correspondingly in planning the increment of sporting results and rating training loads.

2.2. The Unity of an Athlete's General and Special Training

One of the fundamental propositions of the scientific sports school is expressed by the principle of unity of the general and special training of an athlete. This principle originates from a dialectical understanding of the relation between sports specialisation and the comprehensive development of an athlete. Success of the sports specialisation is regularly linked with the progress of an athlete not only in the selected sport but also in many other respects. The generalisation of research data and the advanced experience of the sports practice obviously go to prove it.

Since the organism is an integral whole, one of its properties cannot develop in isolation from the others. Interrelations may be positive (when the development of one of its properties enhance others) and negative (when some properties progress to the detriment of others). Of principal importance in the relation under examination is the following: for a maximum development of certain physical abilities the general level of the organism's functional abilities has to be increased. No matter how narrow is the subject of the sports specialisation, the progress in it is conditioned (in an absolute majority of sports) by the many-sided physical development of an athlete, although the relation of the degree of development of different physical abilities has in each case its own specifics. A lop-sided specialisation when this regularity is ignored, contradicts the natural development of the organism. Temporarily such a specialisation can be accompanied by the growth of sporting results, sometimes even considerable, but in the long run it turns out to be lost and not only in the sporting respect. Thus, according to recently obtained biological data, constant exploitation of a narrow range of functions contradicting the regularities of the plastic renewal of the organism's structures, may in extreme cases lead to pathology.

The significance of the comprehensive development of

an athlete for his perfectioning in the selected sport is determined further by the regularities of forming and perfecting the motor skills (the so-called "shift" of the motor skills). From the general mass of the accumulated knowledge it is known about these regularities that complex motor skills of the sports type arise on the basis of forms of coordination of movements acquired earlier and included in them as prerequisites. Such prerequisites are expanded in the process of the mastering of various motor coordinations, and the ability towards further perfectioning of the motor activity develops. Therefore, in principle, the broader the range of skills mastered by an athlete (naturally, within certain boundaries depending on the specifics of sports specialisation), the more favourable are prerequisites for the formation of new forms of movement and the perfectioning of those mastered earlier.

Thus, **to progress in sport a number of regularities demand that the training, while ensuring maximum degree of perfectioning of an athlete in the selected sport, must at the same time assist his comprehensive physical development and general "motor" education.** There is no formal and logical contradiction in the demand harmonically to combine versatile and deep specialisation, but there is a real inner dialectic in the development process. It is also doubtless that the degree of sporting perfection depends on the general cultural level of an athlete, on his inner wealth, all-round development of his intellectual and other abilities. Therefore, a rational system of sports training organically combines all aspects of an athlete's upbringing.

The unity of the general and special preparation in the Soviet sports school is preconditioned both by the regularities of sports perfectioning noted above and by the cardinal demands of the entire social system of education aimed at the harmonious development of a personality and all-round preparation for socially-necessary kinds of activity. Hence, the *principle of the unity of the general and special preparation* of an athlete must be regarded *as an expression* in the sports' field of the *general principles of the comprehensive development of a personality* and the link between upbringing and life practice. The historical experience of the formation of the programme and normative foundations of the Soviet sports school has become one

of the main sources of this principle. It is well known that the normative requirements of a single sports classification with the norms and requirements of the Prepared for Labour and Defence complex envisaging a broad physical preparedness have become organically fused in them. This largely preconditioned a rapid growth of sports movement in the Soviet Union. The successful use of this experience in organising sports movement in other socialist countries proved its progressive nature.

While practically incorporating the principle of the unity of the general and special preparedness, the following propositions should be borne in mind emphasising the character of the interrelation of these aspects in sports training:

1. Inseparability of general and specialised training, as equally necessary aspects of sports training. It follows from this that neither of these aspects can be excluded without detriment to the perspectives of sports perfectioning and the final goals of the use of sport as a means of the comprehensive upbringing of an athlete.

2. Interconditionality of the content of the general and special preparedness. The content of the special preparedness depends on those prerequisites which are created by general preparedness, while the content of the general preparedness assumes definite peculiarities depending on sports specialisation. No matter how paradoxically it sounds, an athlete's general preparedness is also being specialised as the sports specialisation deepens. It does not become specialised in the direct meaning of the word, but is being differentiated in this or that component as applied to the specifics of the chosen sport. The general essence of the specialisation of the general preparation in the process of sports training is to use more fully the effect of the positive transfer of the level of training (from the general preparing exercises to the special preparing and competitive ones) and exclude or at least restrict the effect of the negative transfer. This finds a corresponding expression in the selection of the means of general training and methods of their use. This explains the differences of the general preparation in each concrete case of sports specialisation, which are expressed the more significant the greater one sport differs from another. Hence, it is clear that the harmonious development

of an athlete cannot be ragarded as a "levelling out" of all his abilities in the process of sporting perfectioning.

3. Incompatibility of the general and special preparation and a necessity to observe a certain measure of their correlation in the process of the sports training. The unity of the general and special preparation must be understood as a unity not devoid of contradictions (in the dialectic meaning of the word). Not all correlations of these aspects during training will be useful for sporting perfectioning. An excessively great volume of general training entails a reduction of the necessary volume of special preparation and, therefore, of its effect, expressed in the development of a special training level. On the other hand, an excessive reduction of the volume of general training for the sake of the special training narrows down the "basis" of sports specialisation, which, in the final analysis, also has an unfavourable effect on the growth of achievements.

This poses the problem of an optimal combination of the general and special training—the problem of the measure of their correlation. The complexity of the preparendess conditioned by the fact that, firstly, each sport poses its own requirements as to the structure of the preparedness of an athlete (the necessary correlation of its components), and, hence, to the structure of his training; secondly, a number of the components of the preparedness of an athlete, especially physical, in greater measure than others depend on the hereditary preconditions and, therefore, in the least measure yield to a direct alteration, which leads to the individual specifics in the correlation of the general and special training; thirdly, inter-influence of various components of an athlete's preparedness (including the character of the "transfer" of a training level) does not remain constant but changes at different training stages and in the process of the age development of an athlete. This makes it binding when determining the measure of correlation of the general and special preparation to take into account the level of his preparedness, individual and age peculiarities, the specific features of the selected sport and training stages. At present certain quantitative landmarks have been elaborated in sports methods for setting correlations of general and special training at different stages of the year-round and

many-year training process. Their fundamentals will be discussed when characterising the training structure.

2. 3. Continuity of the Training Process

Continuity as the regularity of the training process in sport is characterised by the three propositions:

1. Sports training is in fact a chain of year-round and many-year sessions, guaranteeing maximum effect of the sports specialisation.

2. The bond between the links of this process is ensured on the basis of a continuity of the immediate, delayed and accumulative training effects.

3. The intervals between the training sessions are kept to the limits guaranteeing a steady development of the training level in the general tendency.

The essence of these propositions has been partially identified during the analysis of the general pattern of the training process. Practically, they are seen in the system of regular sessions, the concrete traits of which are conditioned by a number of circumstances, influencing the regime of a training session: the initial level of preparedness of an athlete, his commitment towards sports achievement, individual peculiarities of rehabilitation after training loads and the tempo of development of the level of training, specifics of sports specialisation, time budget, time for engaging in the selected sport, etc. Nevertheless, in all cases the requirements ensuing from the above propositions remain just, i. e., in any case it is necessary to plan the training process so as to ensure maximum continuity of the positive effect of the training sessions possible in the given conditions, exclude unjustified intervals between them and reduce to a minimum the regression of the training level in training phases, objectively connected with the reduction of the volume and intensity of loads. In this, briefly speaking, lies the main essence of the **principle of the continuity** of sports training.

In modern sport (and not only in training an athlete of the highest qualification) training sessions daily and even more frequently practically become a norm. Thanks to this sports training assumes the traits of a genuinely continuous

process and differs from other forms of physical training by a p a c k e d regime of loads and rest. Such a regime is especially characteristic for training microcycles, ensuring essential shifts in the development of the training level. It has already been said that a part of the sessions in such microcycles are conducted as if against the background of a partial rehabilitation of the work capacity. This increases the total effect of loads and creates an especially powerful stimulus for further rehabilitating and adapting processes.

Experimental data, depicted as a diagram, serve as an example illustrating the increase of the effectiveness of the training level when training effects are packed. Two variants of the distribution of training sessions in time are compared in the experiment. In variant A the training was organised within the framework of microcycles, which included a series of daily loads and a rest phase; in variant B the training sessions were conducted at a maximum once every other day. In both variants each session included work of a continuous character similar in intensity performed in duration "to the maximum". In the first variant part of the session was conducted when the work capacity was not fully restored (in the diagram it is shown by a declining curve, disignating an ultimately permissible amount of work "to the maximum" at the final sessions of each series); in the second variant each separate session was conducted till full rehabilitation of the work capacity (this has been connected with the prolongation of rest intervals between sessions). The dynamics of the ultimate amount of work from session to session is presented in the diagram for both variants. It is clearly seen that training according to variant A was accompanied as a general tendency by a considerably higher tempo of the increment of the work capacity (in certain cases the work capacity increment ratio was nearly thrice greater than in variant B).

The greater part of the sessions in sport training is also conditioned by the intricacy of sports skills, constant renewal of sports technique and tactics (especially in such sports as combined–event gymnastics, sports games, single encounters) and the aim at maximum perfectioning. It is clear that with the increase in the number of sessions

the possibility of mastering, expedient restructuring and an utmost honing of sports skills also increases (if, of course, the optimal measure of the number of repetition is not violated). A heightened stability of the motor skills to the discoordinating fatigue effect increases in conditions of the strict load and rest regimes. Research of the last few years testifies to the expediency of periodic summation of the load effect of a competitive character so as to facilitate the development of a specific endurance and ability to self-mobilise to the utmost.

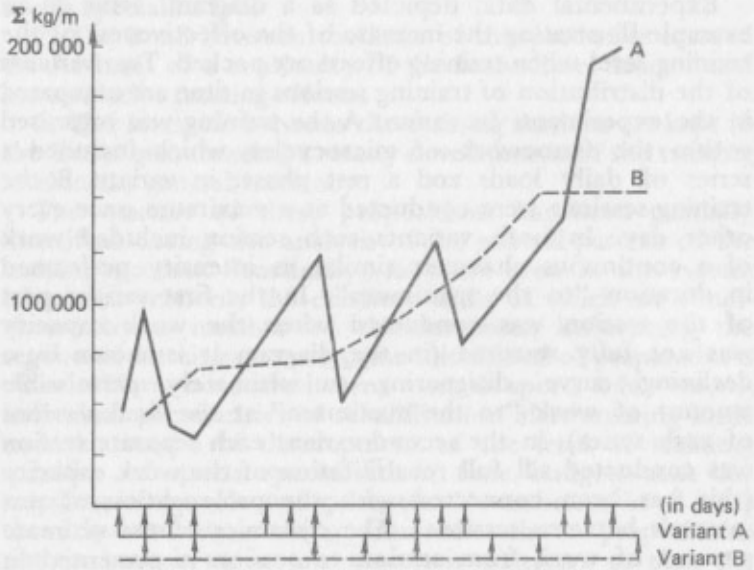

Fig. 6. **An example illustrating time dependence of the cumulative effect of the training sessions.** Arrows along the horizontal line show training session days; along the vertical line—total training work performed in the regime of a continuous exercise "right up to the hilt" with a given power of 1,200-1,500 kg/min.

It is not difficult to reach the conclusion that the general rule of the methodology of physical education, to begin regular sessions against the background of a complete rehabilitation or super-rehabilitation has a specific

meaning in sports training methodology. Here this rule is very often spread only to definite sessions from those constituting a training microcycle. It goes without saying that the necessary condition here is a sufficient preliminary preparedness of an athlete and a rational sequencing of concentrated loads with the necessary compensatory rest which may have the character of a relative "unloading" (sessions without considerable loads, ensuring above all active rest) as well as rest in the direct meaning of the word. Alongside this a number of main sessions, which are not primarily aimed at the development of endurance, are conducted, as a rule, in conditions of a heightened work capacity relative to those exercises which are the main in given sessions, especially when the aim is to master new intricate skills or develop an athlete's coordinating and speed abilities.

Heterochronity (unsimultaneity) of rehabilitation of various functional abilities of the organism after training loads and heterochronity of the adaptive processes undergoing at various levels of its structural and functional adaptation to the training effects allows, in principle, to train daily and not only once a day without fatigue or over-training.* This calls for a thoroughly thought out variation of sessions (changing content and methods, parameters of the volume and intensity, alternating sessions as to their general direction and regulating intervals between them), with due account of the heterochronity of rehabilitation and adaptation to loads of various kinds. Therefore, the principle of continuity of the training process does not boil down merely to the requirement to repeat training effects as many times as possible. It presupposes a regular combination of the elements of recurrency and changeability in the system of training sessions and permits many variants of planning a training session if they help to ensure a relatively high pace of the progressive development of the training level.

* Heterochronity in this case does not mean an artificial desynchronous "disbalancing" of the organism's vital functions. It is a natural regularity of the processes of adaptation and development of an organism which as a general biological and physiological fact attracts ever closer attention.

2. 4. Interrelation of Gradualness and the Tendency to Maximum Loads

The link between sports achievement and the volume of training loads, which has been noted a long time ago, served at one time as the ground for formulating a "principle of maximum loads". With time many experimental factors were obtained directly or indirectly proving that loads nearing the limit of the functional possibilities of an organism may cause, in certain conditions, considerable progressive changes in it and as a result lead to the increase of its potential.

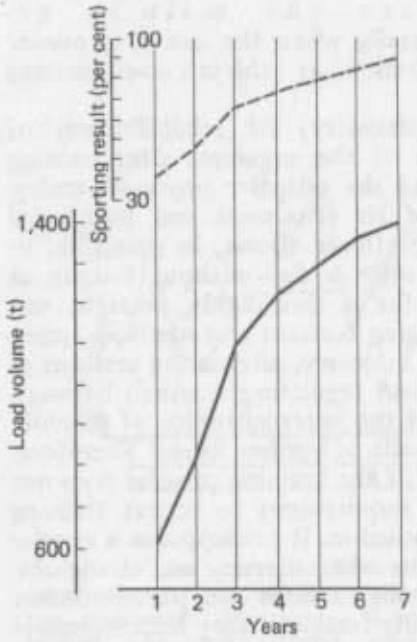

Fig. 7. The dynamics of the general increase of the load volume (according to the total tonnage in exercises with the bar) and of sporting results of the weightlifters in the first seven years of the specialised training.

In this connection sports practice itself provides most extensive and indicative facts. The comparative analysis of the dynamics of sporting results in sports history and in modern sport invariably proves that the growth of the sporting achievements corresponds to increased training loads.

Modern sport practice essentially changed the former notions about accessible load values. Man's abilities and the degree of their development turned out to be higher than most bold surmises. In this connection greater training loads are being introduced into practice on an ever bolder and wider scale. They are increased in individual training sessions as well as in the sum total for a week, a month, a year and in the entire sporting activity over many years.

The notion *"maximum training load"* so far is not notable in its strict definiteness. In the first approximation we call maximum a load at which an athlete realises his functional abilities in the full measure his training level allows. This formulation focuses our attention on the fact that what is meant here is not an ordinary load, but a more significant one than all the others. Besides this maximum is relative in character: what is a maximum load at one state of training ceases to be such at another level of training. Thus, with the increase of the functional abilities of an organism in the process of training the load which formally was maximum can become an ordinary one. It means that the actual parameters of the maximum load can be determined only relatively according to the specific training level. *Tables 5* and *6* give a certain approximate notion about the maximum load parameters of high performance athlete.

Table 5

Certain Load Parameters Reached in Sport*

Sports and load parameters	Time limits			Notes
	Days	Week	Month	
Cyclic sports				
Kilometres: Cycling (road)	580*)	1,400	5,600	*) In 26 hours and 37 min
Running (long distance)	259.6*)	600	2,300	*) World record in daily running
Walking	214*)	400	1,500	*) World record in daily walking

Continued

Skiing	150	400	1,300	
Rowing	80	300	1,000	
Swimming	45,5*)	150	500	*) For 7 hours 57 min
Acyclic speed-strength sports				
1. Shot put, number of pushes and throws	500	1,200	4,500	Besides pushing a standard shot, account has been taken of others, too
2. Weightlifting, number of lifts	250	1,200	5,500	
Average bar weight (kg)	217*)	210	205	*) Per one lift without taking into account the warming up and local exercises
Sum tonnage (tons)	50	200	600	
3. High jumping, number of jumping exercises	120	340	550	Besides main jumps included into are special preparatory jumps
Encounters				
1. Number of training bouts in wrestling	16	40	160	
2. Number of trains ing bouts in fencing	20	55	200	
Gymnastics number of elements	1,000	5,000	20,500	
number of combinations (on the whole)	50	200	650	

* The table besides the author's material reflects data obtained by a team of staff workers of the All-Union Central Institute of Physical Culture and the All-Union Research Institute of Physical Culture with the participation of more than 100 experts. Load indices are given in a number of cases to the nearest figure division.

Table 6

The Number of Competitions and Starts in the Practice of the Best Athletes, Seemingly Maximum (or Near Maximum) at the Modern Development of Sport

Sports	Number of competitions and starts (in brackets)*		
	in a week	in a month	in a year
1. Cycling (track)	4(32)	16(100)	100(280)
2. Cycling (road)	2(14)	3(28)	24(160)
3. Athletics, running (sprint)	3(8)	10(22)	65(128)
4. Swimming	2(12)	9(21)	35(120)
5. Athletics, running (average distance)	3(6)	7(14)	49(80)
6. Skating	2(8)	8(22)	46(82)
7. Athletics, running (long distance)	2(4)	8(14)	58(76)
8. Rowing	2(8)	4(14)	30(80)
9. Skiing (races)	3(5)	8(12)	46(70)
10. Walking	2(2)	5(5)	24(24)
11. Track and field (jumping)	5(25)	18(90)	65(320)
12. Throwing	5(26)	14(68)	60(310)
13. Weightlifting	3(19)	5(33)	20(130)
14. Wrestling	2(6)	3(10)	34(105)
15. Fencing	2(7)	4(15)	20(70)
16. Boxing	2(5)	3(7)	15(40)
17. Ice hockey (number of games)	4	16	110

Continued

18. Basketball (number of games)	6	15	100
19. Gymnastics	3(32)	4(70)	43(618)

* "Start" is every separate phase (attempt) in a competition, the result of which determines permission to the next competition phase or influences the final evaluation of the achievement (preliminaries or final runs, heats, qualifying and following attempts in throwing and jumping, every approach to an apparatus, etc.)

The table also covers the official and semi-official competitions (including friendlies, demonstration performances, etc.) as well as performances not only in the main competitive exercise but also in related sports.

An expediently-rationed maximum training load is not always equivalent to "right up to the maximum", to an utter fatigue. The border line of principle, which divides justified maximum loads from those "beyond the maximum", lies in the correspondence of the requirements to the organism and to its adaptive abilities. If an athlete working "right to the maximum" oversteps this border line he, as a consequence, develops an over-trained condition while the justified maximum load, demanding a full measure of the organism's real functional abilities is a factor of the highest uplift of the training level. In other words, it is the *load reaching the borders of the possible functional activity of the organism, but in no case overstepping the borders of its adaptive abilities.*

It should be borne in mind that the volume of the maximum training load does not boil down only to the intensity or only to the volume. Just as in any other load, this volume is a derivative from the magnitudes of the volumes and intensity. Highly intensive but limited loads (short runs with maximum speed, one-time lifting of bars of great weight, etc.) just as big in volume but of little intensity loads (long runs of a moderate intensity, etc.) do not give grounds to call them maximum loads in the full meaning of the word. Only the combination during training of a high-intensity training with a considerable total volume ensures maximum load. There is a great multitude of such combinations, which, in particular, makes appraisal of the maximum load and its co-measuring in various sports difficult.

General methodological rules and conditions of the

expedient use of maximum loads in sports training ensue from the principles of accessibility, individualisation, systematic approach and the health factor. The higher the absolute load level, the more acute is the problem of rationing and regulation in correspondence with the potential of an organism and individual specifics of its reaction to the load, just as is the problem of an intensive control over its effect.

In every case there is a "critical" value in the training load. If it is exceeded, it will lead not to an increase but to a decrease of the positive training effect. This value is the smaller, the lower is an athlete's training level.

It has been established, for instance, that the effect of the greatest oxygen consumption in certain variants of the interval training is achieved in some of the beginning runners in the case when the sum load volume in a session is no more than 80-100 minutes. With its increase the sum oxygen consumption drops. In highly qualified runners it is noted when the loads exceed 3 hours.

The change of the limits of the "critical" load value in the process of training depends on the individual peculiarities of adapting to loads. Thus, many athletes adapt themselves relatively easily to heightened loads followed by a proportional increase of their sporting results, while with others only by unproportional. With some athletes even a relatively small increment in the training loads results in a rapid increment in the results, while with others analogous results are achieved with considerably higher loads. The individual peculiarities of the adaptive reactions to the training loads make it binding to take into account the measure of maximum loads during training (here one of the practical methods is a regular comparison of the individual rates of increment of the loads and rates of increment of the sports or control and test results: any sharp discrepancy of this or that—is a signal for a revision of the chosen line of planning loads).*

* The absence of the increment of sporting results with the sharp increase in training loads, as is clear from the above, cannot serve as a sufficient ground for the conclusion about an athlete being non-perspective. Perhaps, there was a simple violation of the individual measure of load increment.

At first glance two incompatible traits are combined in the dynamics of training loads— g r a d u a l a n d s p a s m o d i c c h a r a c t e r (i. e., breaks in continuity, "leaps" of loads, when it periodically increases to the maximum accessible at the given training level). It is yet one of the manifestations of the real dialectics of the training process. The "leaps" in the dynamics of the loads while placing maximum requirements to the functional and adaptive abilities of an organism are necessary as a specially active factor stimulating the level of training. But such "leaps" are justified only when they are prepared beforehand by a gradual increase of training requirements. Otherwise, being in contradiction to the adaptive abilities and with health, they sooner or later will have a negative effect on sporting results. On the other hand, gradualness, not combined with sufficiently high rates of increasing loads, leads to a slowed down development and then to a cessation in the increase of the training level. Gradualness and the spasmodic character in the dynamics of training loads are mutually conditioned. They do not exclude each other (as is often the opinion in the theory and practice), but are regularly bound one with the other.

The increase of loads in the process of many-year training is observed as a general tendency at all its stages. The main reasons for stabilisation and for a subsequent gradual decrease of load parametres at the final stages lie, firstly, in a natural decline of the functional and adaptive abilities of an organism with age (although practically it is rarely the main reason); secondly, in the necessity to redistribute the general time budget, when the athlete enters the sphere of the professional work he has chosen. Load stabilisation in the process of many-year training tells first on the limitation of certain parameters of their volume depending directly on the total time expenditures (the total number of training sessions and days a week, a month, etc.) Some of the other indices of the volume and intensity of the training load may increase in principle right up to a level when age limiting factors begin to operate. After that the load increase stops to be the general tendency and remains within the limits of separate training periods.

2. 5. Wave Nature of the Load Dynamics

The tendency of a gradual but at the same time steep increase of loads in sports training are identified in the most natural way in their wave-like dynamics. True, the form of the "wave" appears to be specially adapted to combine these tendencies, especially if the training is organised as an uninterrupted process and the general level of loads used in it is sufficiently high. It is not accidental that with the going over to the year-round training along with a sharp increase of the volume and intensity of loads in modern sport the wave nature has become a typical trait of their dynamics. In the last few scores of years it attracts increasingly close attention.

Research data and empiric materials amassed at the present moment testify to the fact that wave oscillations characterise load dynamics both in relatively small and more prolonged phases (stages, periods) of the training process. Correspondingly we can single out "waves" of several categories:

a) small, characterising load dynamics in the training in microcycles;

b) average, expressing a general tendency of loads in several microcycles;

c) big, which are revealed when evaluating the general tendencies of load dynamics in several average cycles which make up the stages or periods of training microcycles.

The imperfections of the existing methods of generalised evaluation of the training load do not allow so far to compile a precise qualitative characteristic of all the categories of the "waves" and their correlation in the process of training. In principle it is clear that they are not chance in character. The inevitability of the wave-like oscillations of the training load is explained by a whole complex of interrelated causes. Most essential of them are, firstly, the phase character and heterochronousness of the rahabilitation and adaptation processes in the course of training; secondly, periodical oscillations of the work capacity of the organism, conditioned by its natural biorhythms (daily, weekly or more prolonged) and by general environmental factors; thirdly, correlations of the load volume and intensity which make these aspects change in a different direction at definite phases of the training process.

It is known from general physical education theory that the wave nature is not the only possible form of the training load dynamics. The shorter the training process phase and the lower the absolute level of the loads, the more varied, principally speaking, can the forms of their dynamics be. That is why we often observe in the training microcycles not only wave-like but also other variants of the dynamics of certain load parameters (rectilinearly-ascending, step by step, etc.). If we limit ourselves by a relatively small frequency of sessions and fix the load intensity, we may ensure a steady increase of its volume not only in the microcycles but also in the course of a sufficiently prolonged training stage. However, the picture changes in principle as soon as the intensity of the training process becomes sufficiently great and the necessary degree of increasing of both the volume and the load intensity is ensured. Under such conditions the succession of the three phases becomes regular: the phase of the increase of the total load, the phase of the temporary stabilisation or reduction of some of its parametres for the sake of a considerable increase of the others and of the relative "unloading" phase. This on the whole characterises the "wave" of the dynamics of training requirements. The "wave" shape thus allows to successively combine the high ratio of the increase of the volume and intensity, thus guaranteeing an onward development of the training level and at the same time reduce to a minimum the danger of over-training. The duration and the degree of the change of certain load parameters at various phases of its wave-like oscillations depend on the absolute load value, the level and ratio of the development of the training level of an athlete, peculiarities of a sport and training stages.

The wave-like change of the loads at the stages directly preceding the main competitions is conditioned, firstly, by the regularities of the "lagging transformation" of the cumulative effect of the training. Outwardly the lagging transformation phenomenon reveals itself in the fact that the dynamics of sporting results appears to lag in time from the dynamics of the training load volume: the acceleration of the result increase is observed not at the moment when the load volume reaches particularly considerable magnitudes, but after it has stabilised or dropped. Hence, in the

process of training for competitions the problem of adjusting load dynamics is moved to the forefront so that their general effect is transformed in the sporting results in planned terms.

It is not difficult to draw up from the logic of the correlation of the volume and intensity of load parameters and formulated here propositions the following rules relating to training dynamics:

— the smaller the frequency and intensity of the training sessions, the longer may be the phase of a steady increase of loads, but the degree of their increment is each time insignificant;

— the more intensive the load and rest regime during the training, the briefer the periods of the wave-like oscillations in their dynamics, the more frequently "waves" appear in it;

— at the stages of a particularly considerable increase of the total load volume (necessary to ensure long-term adaptations of the morpho-functional character) the share of high-intensity loads and the degree of its increase are limited, the greater, the more considerably the total load volume increases and vice versa;

— at the stages of an especially considerable increase of the total load intensity (this is necessary for speeding up the ratio of the development of a special training level) their overall volume is limited the greater, the more considerably their relative and absolute intensity increase.

Although these rules are not always taken into account in the obvious form, actually, they are always taken as guidance when planning a training session in certain conditions.

A question may arise: is the wave-like form of the training load dynamics always preferable to others? In practice the training load dynamics are formed under the effect of a multitude of different circumstances. But different variants of dynamics may be justified at different stages as particular tendencies depending on concrete circumstances. In the process of the year-round training of many years as the general level of loads increases, their dynamics invariably acquire if not strict wave-like forms, then forms similar to them, since they correspond in the utmost degree to the continuity of the training process, its directiveness towards

the maximum results and other regularities of sports training.

2. 6. The Cyclic Nature of Training Process

Besides the noted regularities of sports training, it is characterised by a clearly-defined cyclic nature. The training cycles are a relatively finalised recurrent continuity of the links and stages of the training process (sessions, stages, periods) alternating as if in the manner of circulation. Every current cycle is a partial repetition of the previous one and at the same time expressing the tendencies of the development of the training process, i. e., differs from the previous by a renewed content, partial change of the pattern of the means and methods, an increase of the training loads and so on. Its effectiveness decisively depends on how retionally its recurring and dynamic traits combine in planning the training.

The entire training process—from elementary links to the many-year training stages— is built in the form of cycles. The training cycles of three categories: small, or "micro-cycles" (for instance, weekly), middle, or "mesocycles" (for instance, monthly) and large, or "macrocycles" (for instance, yearly) have been singled out in the introductory characteristics. There is every ground to speak about more lengthy cycles, in particular, four-year (Olympic), although their structure has not as yet been sufficiently studied. The cycles in this sense are a universal form of planning the training. This is exactly at what the principle of the cyclic nature of the training process is aimed at.

To be guided by this principle means:

—while planning the training to proceed from the necessity to systematically repeat the basic elements of its content and at the same time consecutively change training assignments in correspondance with the logic of the sequence of the phases, stages and periods of the training process;

—while solving the problems of the expedient use of the means and methods of training, to find for them a corresponding place in the structure of the training cycles (because any training exercise, means and method, no matter how good in themselves, lose their effectiveness if not used timely, or used out of place, without account being taken of the specifics of training phases and periods);

—to ration and regulate training loads as adopted to the regularities of the change of training phases, stages and periods (it has already been shown that the wave-like changes in the training load dynamics—small, average and big "waves"—appear in a certain correspondence with the training cycles of different duration—micro, meso, and macrocycles);

—to regard any fragment of the training process in its interrelation with the bigger and lesser forms of the cyclic training structure taking into account that the structure of the microcycles, for instance, is greatly determined by their place in the structure of the average cycles, while the structure of the average cycles is conditioned, on the one hand, by the peculiarities of their microcycles and, on the other, by their place in the macrocycle's structure, and so on.

The general essence of the principle of the cyclic nature is expressed in these requirements. Its content is revealed more concretely in the detailed analysis of the structural foundations of the planning of the training process. This in fact makes up the problems of a special section of the present course.

PART TWO

THE MAIN SIDES (ASPECTS) OF COACHING AN ATHLETE IN THE PROCESS OF TRAINING

Chapter Four

The Moulding of Moral and Will Qualities; Special Psychological Preparation in the Training Process

1. DETERMINING THE DIRECTION IN THE MOULDING OF AN ATHLETE AS A PERSONALITY

1. 1. Development of a Lofty Moral Fibre—the Foundation of Raising an Athlete in the Soviet Sports School

In accordance with the general direction of the system of education in our society the formation of the consciousness and behaviour of an athlete in the spirit of the communist morality is a pivot of the educational process proper in the Soviet sports school. Problems of sporting motivation, sports and aesthetic education, moulding of a "sports" character and other educational problems in the sports field are resolved on this basis. The source of the force and purity of the Soviet sports movement lies in the lofty moral principles expressing genuinely humane social relations and ideals. Sports activity, occupying an essential part in man's life, becomes one of the main factors of moral education and self-education. At the same time intricate educational problems are posed. Above all, the moulding influence of sport on a personality is realised in the specific conditions of inter-individual and the broadest inter-human relations far beyond the framework of purely pedagogical relations.

It has already been pointed out that sport, examined from the point of view of its influence on an athlete's moral make up, cannot be regarded simply as a positive or negative factor. Its educational effect in decisive measure depends on the conditions of the social and pedagogical organisation of the sports activity. The same traits of sport can, under different conditions, facilitate the formation of directly opposite traits of personality. Thus without a high moral motivation and without a proper regulation of the

behaviour of an athlete sharply conflicting situations can arise and instructions to win may awaken in the athlete an unrestrained desire for self-assertion at any cost and spark off egotism and such like traits. In the same way the atmosphere of popularity surrounding an outstanding athlete, the honours and awards accompanying his sporting achievements may form in him a psychology of an "idol of the crowd", engendering excessive ambition and conceit if this is not countered by well-thought out measures of raising a feeling of a public duty, self-criticism, modesty and other qualities which guarantee "immunity" against overestimation of his personality no matter what circumstances.

The shaping up of an athlete's personality is the result of the joint action of many factors: the social system of education, including the family, school and the main collective, of which the athlete is member, teachers and other people and organisations carrying out educational functions. The coach in the Soviet Union is entrusted with the responsible task of supervising the development of the athlete's personality. He is directly responsible before society for the comprehensive educational direction of sports sessions, pedagogically justified organisation of training as a process in conformity with the general direction of communist education.

Being an educator in the full sense of this word, the coach does not restrict his educational functions only to directing his charge's behaviour during training and competitions. A number of circumstances influencing the character of their interrelations objectively facilitates the many-sided and especially close spiritual links between the coach and his charge. These are regular, very often daily, contacts in the process of training sessions, especially at training assemblies and trips to competitions, community of sporting interests, mutual experiencing achievements and failures and searching for new ways of sporting perfectioning which are necessary for success. If a coach possesses not only the narrowly-professional but also all other qualities of a teacher and a citizen and is endowed with teaching ability, he becomes one of the athlete's main tutors who largely moulds his thoughts and behaviour and brings a considerable influence to bear on the entire process of the formation of the athlete as a personality.

There are no tasks higher than educating an athlete to become a fully-fledged member of society, a conscientious and active fighter for communist ideals. The solution of these tasks presupposes a consistent realisation of the principles of communist moral education and skilful use of the rich arsenal of its methods. Important conditions here are the link of sporting activity with everyday life, the upbringing the athlete through a collective, subordination of his private interests to harmonious development of his personality and preparation for creative labour. "We," said Mikhail Kalinin, "develop and prepare not narrow athletes but citizens of the Soviet construction...."*

1. 2. The Athlete's Origins of Motivation and Sporting and Ethical Education

The decisive role of social origin in the motivation of the sports activity. Social and psychological research shows a diversity of individual requirements and motives which lead to one's engaging in sport and form the basis of the inner source of an athlete's activity in the struggle for higher results in sport. Infrequently, especially with children, the original motives for involvement in sport arise by chance or are of little importance from the social and pedagogical point of view (love of the external forms of sports movements, the desire for superiority, etc.). The degree of an athlete's progress along the road of sporting mastery depends primarily on the direction and on what basis these initial motives will develop, how much they will involve and how effective they will be. The coach's first educational task is to develop the athlete's initial motives, interest and requirements into a deep aspiration based on a high aim and firm moral principles.

The forming of an athlete's motives is necessarily linked with the aiming at sporting achievement. The fact of attainment of a set result becomes for an athlete confirmation of the reality of the task set and at the same time a source of his outlook towards subsequent results, determining a degree of subjective requirements (an athlete's "claim

* M. I. Kalinin, (1875–1946), a prominent Soviet political and state figure, Chairman of the All-Russia Central Executive Committee.

level" as it is said in sport's psychology). Herein lies the importance of the achievements as a motivating factor of sporting activity. Orientating an athlete to specific results, the coach specifies the athlete's results and thus influences directly the formation of his sporting motives.

However, any attempt to explain the motivative bases of an athlete's behaviour mainly from the standpoint of sporting success (or failure) would simplify the matter too much. The motive of exceeding the sporting result cannot serve as a constant and main motivation for sporting activity over many years simply for the reason that in the process there is not only an ascending but also a descending tendency (especially in the period of the age involution). The main thing here is that the desire for sporting success never exhausts all the main motives of engaging in sport, not to speak about the social aims of sporting activity.

Side-by-side with the formation of motives, directly linked with the realisation of achievement, it is no less important to ensure in the course of the preparation of an athlete a sufficiently strong motivation for training sessions, including ever-increasing loads both in volume and intensity. The aiming at a result even at an athlete's higher "claim level" is not automatically transferred to coaching. One of the coach's most important tasks is to make clear for the athlete the essence of the link between the magnitude of an achievement and the measure of a "contribution" in training, to make it obvious for him and mould in him aspirations which will find expression in his sporting zealousness.

The athlete's motives and aims in the process of sport activities over many years, naturally, are realised, detailed and change their form depending on his abilities, stages of his sporting perfectioning, life conditions and activity. They become more interesting as the athlete matures as a personality. Together with the general stimulating reasons, the motives always express individual features of a moral experience, character and temperament. Relatively constant motives, which have become traits of a personality, merge with temporary (actual) motives, conditioned by a particular situation.

The following very often combine in the structure of motives influencing the participation of an athlete in competitions:

—the motives of a moral duty, patriotism, collectivism (the desire to make one's own contribution to the sporting achievement of a collective, society, to sport's progress, to defend a sporting honour of a collective, etc.);

—the motives of self-development, preparing for life, strengthening one's health (the desire to fathom one's abilities, to develop the necessary physical and psychological qualities, to acquire competitive experience, to test the correctness of training, etc.);

—the motives of self-expression; self-assertion of a personality and other such motives (the desire to win public recognition, to demonstrate one's merits, to win approval, or avoid disapproval from persons the opinion of whom the athlete holds high);

—the motives of positive emotions, aesthetic satisfaction received from engaging in sport and devotion to it (satisfaction from the process of competition, love of risk, the desire to overcome himself, aesthetic feelings, caused by the perfection of movements, beauty of human relations in the tense conditions of competitions, etc.);

—the motives of intercourse, personal and social contacts, the acquaintance with life of countries and peoples.

Among the motives, characteristic for the Soviet athletes, motives of a strictly personal nature dominate rarely (for instance, the desire to obtain a narrow profit or to settle scores with an opponent). Leading, as a rule, are socially important motives. Such motives have a heightened efficiency and are factors of sporting achievements. This is testified not by Soviet sport practice alone. It has been experimentally proved, for instance, that motives connected with a feeling of collectivism bring higher results in competitions than motives of personal success, excluding cases when athlete previously developed the hyperthrophied traits of an individualist.

The most general and essential motives of sporting activity in a socialist society are based on the desire for the all-round harmonious development of a personality, acquiring and perfecting everything that determines the value of a person as an active participant of social progress. These motives are not opposed to the interests of a personality but

ensue from them and at the same time coincide with social requirements expressed in the social aim of education. This is the main prerequisite of an active motivation, justified both in personal as well as in social respect. Hence, it follows from this that the main road of the formation of the motivative foundations of an athlete's behaviour in the Soviet sports school is the road of moulding of the consciousness, ideological conviction and aesthetic qualities in the spirit of the principles of the communist morality. Identifying a profound social and personal essence of sporting activity, instilling feelings of moral duty, patriotism, collectivism and other qualities and feelings characteristic of a man of a communist society, the coach thus moulds in an athlete the feeling of the highest responsibility for his sports preparation and future achievements. He thus creates a motivative basis which is an inexhaustible source of the most imposing and significant deeds.

Sporting and ethical education as one of the aspects of moral education. It is accepted to define the aggregate of norms of behaviour regulating the relations of men in the sphere of sporting activity as "sports ethics".

Along with the development of the intra-national and international sports links, the norms of sports ethics assume a general humane character. Some are recorded in international rules of the competitions in various sports, and in a generalised form—in such official and semi-official regulations as the Olympic Rules.

The tasks of sports and ethical education in the Soviet sports school consist in the setting down of ethical norms which are formed by the entire system of education in Soviet society. Therefore, basically these tasks are not something different in principle from the general tasks of moral education but are in fact some of their practical aspects. In other words, the main thing in sporting and ethical education is to make the general principles of the moral behaviour a practical guidance to action in the field of sport.

The norms of the sports ethics theoretically are grasped easily because generally they boil down to the requirement to behave in sport as it befits a man: to honestly observe the established rules of the competitions, not to resort to prohibited methods of achieving superiority over an oppo-

nent, the avoidance of rudeness, etc. The reason for deviations from the norms frequently lies not in the fact that an athlete does or does not know what is moral in sport, but in the absence of firm convictions and steadfast habits of moral behaviour as applied to sports activity. Its specifics are such that even an athlete possessing general moral convictions but lacking practical experience to establish steadfast habits of behaviour in complicated sports situations may find himself violating the rules of sports ethics. This underlines the prime importance of methods of practical teaching, so as to become familiar with the rules during the process of mastering the norms.

Besides, sports competitions are the most effective form of practical testing of an athlete's fidelity to sports ethics. This fact determines their role in sporting and ethical education. This side of education must always be represented in sports training. Here it is especially closely linked with the content of the tactical, special psychological training of an athlete and with the training forms of competitive practice. This link is ensured particularly by:

—the selection and mastering of technical and tactical actions, flawless in ethical respects;

—the formation of the ethically-justified competitive aims and their realisation in training competitions;

—modelling situations of behaviour which gradually get more and more difficult;

—no-compromise attitude of the coach and of the sports collective to any deviations from the requirements of sports ethics in the process of training sessions.

2. MOULDING THE WILL AND OTHER QUALITIES OF SPORTS CHARACTER CONNECTED WITH THEM; SPECIAL PSYCHOLOGICAL TRAINING IN SPORTS

2.1. Moulding the Will (Will Training)

Tasks. The significance of the will qualities in sport is so obvious that the notion "athlete" is usually associated with the idea of a "strong-willed person". Although the essence of will proper in general psychology and in sports psychology is so far treated in various ways, actually no one doubts that an athlete's properties and abilities, signified by this word, are highly necessary in any sport.

Such qualities of will as purposefullness, initiative, resolution, courage, self-control, persistence and staunchness are singled out (with certain variations in names) among the athlete's basic will qualities. Since these qualities as any other of man's psychic characteristics cannot be evaluated directly, it is extremely difficult to give a strict definition of their role in various sports. Nevertheless, relying on practical experience and common sense, it is correct to assert that regardless of sports activity an athlete needs an aggregate of all the developed will qualities and, therefore, an all-round instillment of them must be the main part of an athlete's training.

It is known that the identification of will in various sports is specific since every one of them has requirements of its own as to will qualities, determined by the conditions at hand and the form of activity, arising in the process. An analysis of the specifics of will manifestations in various sports gives ground to speak about the "structure of will qualities" as represented in various sports specialities. According to these notions, it is characterised, depending on sports specialisation, by unequal "central" and "supporting" links, unequal relationships of will qualities.

With long-distance running, for instance, it is persistence that is essential, for those specialising in sports with a heightened degree of risk (for instance, ski jumping)—courage and resoluteness, with gymnasts—self-control. Supporting links are distinguished correspondingly. Despite the insufficient strictness of such characteristics of the structure of will qualities, there are no doubts in principle that the degree of their identification can only depend on the particular chosen sport and the specifics objectively inherent in it. Hence the particular requirements of an athlete's psychic qualities.

Adopting this to the tasks of will training it is not difficult to conclude firstly, that the requirements organically merge with the tasks of a weighty motivation of an athlete's behaviour, of the moulding of the moral and intellectual foundations of sports activity, taken in their practical aspect. The solution of these tasks makes up an inalienable part of the moral and intellectual development of an athlete and at the same time an important side of his will training—what can be called moral-willed and intellectual-willed

development; secondly, their solution must facilitate the general all-round development as permanent traits of the character and ensure a maximally high degree of their manifestation in the form of abilities answering the specific requirements of the chosen sport.

The will qualities which an athlete develops in accordance with the specifics of the sport and which have become his traits, determine the most important property of the "sports character"—will to victory, combining in it a high daring, the ability to ultimate mobilisation and concentration, confidence and emotional and general psychological stability. Such traits of character as discipline and sports diligence are moulded in unity with these properties.

Since the development of will qualities, reflected in the motor activity, has the perfectioning of physical qualities and skills as their material prerequisite, the practical tasks of will training of an athlete are resolved on the basis of the realisation of the tasks of his physical, technical and tactical preparation. These aspects of training are not simply interconnected but in many things greatly coincide with each other.

Fundamentals of methodology. Alongside the general factors of training a whole complex of the main means and methods of training is used to instil will qualities and all those connected with them. The orientation of an athlete's activity at overcoming increasing difficulties is of a decisive importance here.

It has long become a simple truth that the will is moulded in overcoming difficulties. However, it is justified only in definite conditions: if difficulties are overcome systematically, and not occasionally; if the degree of the increasing difficulties does not exclude the possibility of their overcoming. The objective logic of a training process presupposes all these conditions since the laws of the perfectioning in sport place an athlete before the necessity systematically to overcome the difficulties of training loads and require that they are increased and optimally regulated. Thus, the system of training loads simultaneously presents a system of factors of will development.

The practical basis of the methodology of will training in sports training is as follows:

—the training programme and competitive settings must be realised regularly;

—additional difficulties are to be introduced systematically;

—competitive occasions and relations to be made use of;

—self-education functions to be consequently intensified.

The athlete must be taught to make sure to carry out the training programme and competitive settings. The habit of bringing any matter to the conclusion, to be always responsible in everything, is formed in the course of training through a strict carrying out of the system of training assignments, well-thought out and adopted as a real programme of action. If the assignment is reasonable and feasible, its execution must be a law for an athlete. A weighty motivation, as has already been said, is the first prerequisite of such an attitude of an athlete to his training. An athlete must be deeply convinced (the coach is called upon to ensure it) that there are no easy roads to sporting heights and that these achievements become the closer, the higher the degree of efforts spent on their fulfilling. Here the tasks of the will training are closely connected with the tasks of instilling sports industriousness.

It is especially important and difficult to realise the demand to resolve the task set to the end while executing competitive exercises. The sources of uncertainty, which may overgrow into a habit of ceasing competition altogether as soon as a critical situation develops, are hidden in deviations from this demand. It must be assumed that this is one of the reasons of the appearance of the "psychological barrier". It would be an ideal thing if competitive exercises would consummate in a successful attempt every time regardless of whether they are executed in a training or competitive form. Both objective and subjective circumstances stand in the way which the coach, setting a task for an execution of a competitive exercise, must thoroughly weigh up to make the real demand that this exercise be executed.

Besides everything else it must be taken into account that the level of an athlete's ambition very often exceeds a certain magnitude the result of which at the moment is actually not within his abilities. Practical divergence between them forms a feeling of uncertainty and urges the athlete to avoid competitions. No matter how paradoxically

it may seem, the problem of fighting uncertainty in the process of training arises not only when the athlete had developed this feeling but also when he is self-assured. A careful rationing of the quantitative aspect of the assignments in accordance with the athlete's actual abilities and teaching him to make sure to realise them are the necessary interrelated conditions of the formation in him of a firm certainty and sober self-appraisal.

A businesslike style of organising training sessions, a strict regime of training, a personal example of a conscientious attitude towards training, which the coach constantly sets by his example, the tradition formed by him and by the entire collective to fulfil the obligations voluntarily taken upon himself, largely facilitate the instilling of habits towards systematic efforts and persistence in overcoming difficulties.

Introduction of additional difficulties. Despite the fact that a regular increase of physical loads in the process of training means a regular increase of the psychological loads, difficult situations have to be additionally created, demanding a further display of will, to influence the direction of development of an athlete's will qualities, especially in the periods when he has adapted himself sufficiently well to current training loads.

Table 7

Examples of the Methods of Introducing Additional Difficulties in the Process of an Athlete's Will Training

The basis and the preferential directiveness of a method	Examples
Introduction of an additional assignment (which is not told to the athlete beforehand), connected with prolonging a training session against the background of fatigue (aim—instilling self-control and persistence, the ability to endure)	Overcoming an additional lap with an assignment to make a spurt at the end of it and come first;
	introduction of an additional period at the end of the training game with an assignment to win;
	introduction of an additional attempt at the end of the exercises with the bar with an assignment to make maximum number of lifts (if an assignment is carried out in the form of a conditional competition, a relative weight can be set similar for all participants—in percentage to an individual result)
Holding training sessions in complicated conditions of the natural media or with the use of unaccustomed sports gear and equipment (aim—instilling reliable skills and moulding confidence)	Training sessions outdoors in bad weather conditions;
	cyclic exercises at the locality with difficult terrain, in the mountains, on loose soil, with the use of water resistance, etc.;
	transfer of the sessions from indoors to outdoors (in sports game, for instance, this makes spatial orientation more difficult, if before the games were regularly held indoors);
	periodic performance of exercises (with the use of sports apparatus and gear of various quality, weight and size);
	running and jumping with extra weights (lead belt, shoes with weights, etc.)
The change of object and spatial conditions of actions with the aim of enhancing accuracy and confidence of execution	Discus or hammer throwing from a smaller circle;
	high jumps and vaulting with a pole with the posts narrowed;
	sparring on a smaller ring;
	shooting in football and ice hockey at the goal smaller in area
Same thing with an increasing degree of risk (aim—instilling courage)	Balancing exercises on a higher than normal and narrower support;
	diving from a great height, ski jumping from a big ski jump;
	increasing the steepness of curves in skating, in bypassing on the cycling track

Continued

Introduction of discouraging sensor and emotional factors (aim—instilling staunchness and self-control)	Making penalty throws or shots at the training games in conditions of distracting noise (created for instance, by broadcasting of the tape-recording of an emotionally tense meet);
	observance of a pre-set running pace despite the distracting signals of the sound—or light-pacer, tuned to different tempo
Complicating competitive interactions and conditions of the evaluation of results (aim—instilling fighting qualities and will to victory)	Training competitions with a handicap or antihandicap (a shortened bout or a bout with a partner of a higher sports and technical qualification, but having no superiority in physical qualities; fighting alone against several opponents or one team against several or against a team with numerical superiority, etc.);
	reduction of the number of attempts (determining a victory by the result of the first attempt in high jumping) or increasing their number, (up to the tenth hit in fencing);
	determining victory by the "heightened criterion" (to hold an opponent down twice as long as envisaged by the official wrestling rules to hold a cross on the rings at least for 5 seconds, etc.)

Various methods of creating additional difficulties are used in the practice of will training (examples given in *Table 7* explain their fundamentals). Besides, a number of methods objectively linked with creating additional difficulties is used in realising the tasks of physical, technical and tactical training. The logic of overcoming difficulties at various stages of training of an athlete often coincides but not always and not in everything. When, for instance, a ski cross-country run is included episodically into the training of a hammer-thrower, weightlifter or a gymnast, the effect obtained has no significant bearing on physical or technical preparation. However, in the aspect of will preparation this exercise may turn out to be exceptionally effective: overcoming the long distance the athlete will have to overcome, first of all, himself, in particular his negative emotions, intensified by the absence of special training in the unaccustomed work and by the consciousness that in a purely sporting respect it is not absolutely necessary.

Everything that has been said above about the requirements for a necessary realisation of the task and about the methodological conditions under which it is justified, holds true also in the case of assignments with additional difficulties. Naturally, the greater the difficulty, the more thorough should the preparation be for its overcoming. The overcoming of difficulties connected with the "psychological barrier", which unfortunate attempts in the past only intensified, demands meticulously worked out methods.

Use of competitive principles and relations. The paramount significance of the competitive method in moulding sporting character is determined by the fact that it flows from the natural expression of sports activity (the desire to capture first place, aiming for high results). It brings into play the mobilising force of specific inter-personal relations, inherent in sport and thus places before an athlete the necessity of showing his abilities in most difficult situations.

A single competition, even the most important, means very little in the long and complicated process of moulding a character. Only regular participation in competitions and a systematic use of competitive procedures in organising training sessions (try-outs, control competitions in the preparatory exercises, introduction of elements of game rivalry into training sessions, etc.) may serve as factors which permanently operate in the process of moulding an athlete's character.

The effective use of competitions with this aim presupposes, first and foremost, a skilful setting of competitive assignments by the coach corresponding to the athlete's real abilities. This is what an athlete's confidence in his own strength depends on. Otherwise competitions will create "psychological barriers" due to a gap between the "level of claims" and actual results. Several approaches may be used in practice which lessen the possibility of the competitive

assignment not being executed, without diminishing the requirements towards an athlete.

Most widespread among them are:

—execution of the preparatory exercises by the competitive method with the aim of exceeding the training load parameters (training competition with the aim of repeating the general preparatory exercise or the elements of the basic competitive exercise as much as possible, etc.);

—competing in episodically-introduced assignments which do not demand any special initial preparation but requiring psychological mobilisation (for instance, competing in speed of mastering, on the spur of the moment, of new forms of movements or unusual combinations of the elements mastered previously);

—introduction in partially altered forms of basic competitive exercises as an aim of competition (throwing of an extra-heavy object, running distances which are related to the main competitive distance, etc.);

—"shift" of the competitive assignment with an accent on the advantage of the qualitative aspect of an exercise (for instance, competing in throwing a ball for accuracy rather than for distance or for uniformity of strength expenditure during running);

—limiting the level of a result with a heightened demand on the number of its demonstrations (for instance, showing the result which equals 95 per cent of the personal result, as many times as possible in a single exercise).

With such an orientation the limits of the expedient use of the competitive method in training expand considerably.

As the athlete adapts himself to competitive loads and situations the role of the competitive method in will training is not diminished if the level of will-quality requirements increases. This is attained, in the main, by introducing additional difficulties into the training forms of competition and by increasing the number and frequency of competitions (right up to the introduction at certain stages of training of series of competitions, separated from each other by shortened, rigid rest intervals), enhancing the degree of the importance of the competitions and varying their conditions. The official competitions of the highest rank, especially those of significance both in personal and social respect, are the most serious test of an athlete's will

qualities, but the degree of individual difficulties in preparatory competitions may and should be higher than in the main competitions because this allows the creation of a necessary "reserve of strength".

In moulding the qualities of a sporting character it is important to use such competitive factors as the relations of rivalry which are not obvious but which invariably arise in a small sports collective (training group, section), and in the relations connected with a desire for leadership. Subordinating these relations to the principle of collectivism and comradeship the coach must not suppress a healthy rivalry, but direct it along the pedagogically justified channel so as to use it as a mobilising factor in the solution of difficult training and competitive tasks.

Subsequent increase of self-moulding functions. Instilling will is unthinkable without an ability to actively and purposefully control oneself, one's aspirations, feelings and actions. Self-moulding is its highest expression. In an athlete's will training it is necessary to observe with special skill the interrelation between the coach's guidance and the self-dependence of his charge.

Self-moulding of will presupposes, first and foremost, that the athlete understands the essence of his sporting activity and tries to cognise himself ("want to control yourself—first of all cognise yourself"). But the ability toward self-moulding cannot develop by itself, it must be nurtured. The coach's guiding role here is that he must create conditions for a consequential increase in the degree of the reasonable activity, initiative and the athlete's independence in resolving the tasks of sport perfectioning, arm him with knowledge and skills necessary for a fruitful self-moulding and unobtrusively control the results.

Actually all the forms of activity in overcoming difficulties connected both with the outwardly expressed self-mobilisation and with inner self-restrictions may serve as practical means and methods of will self-moulding.

Including:

strict observance of a general regime in life, organised in accordance with the requirements of sports activity. Of importance for self-moulding of will is not so much the effect of getting used to this regime, as to expe-

riencing moments of a regular self-overcoming and self-restriction (inner sanctions)—fighting an inclination toward disorder or excessiveness, negative everyday habits, overcoming "rest inertia", rejection of certain everyday pleasures for the sake of a high goal, and so on (we speak here not about asceticism but about rational self-restrictions, ensuing from the requirements of sports activity and aimed at self-perfectioning);

self-persuasion, self-impelling and self-compelling towards an unconditional execution of the training programme and competitive assignments. This is a central line in the self-instilling of will in the training process. Prolonged concentration of thoughts and feelings on the final result is at times very necessary in overcoming certain difficulties connected with the exceeding of one's own record results. Special methods of the psychological adaptation to objects and other external conditions are expedient in this connection. One of the methods of fighting psychological barriers may be to compell oneself to show a sufficiently high result or necessarily bring the competitive exercise to a happy end under the same conditions (in the same hall, on the same apparatus, etc.), which formerly were linked with an unfortunate performance;

self-regulation of emotions, psychological and general state through autogenous and similar methods;

constant self-control, including current control of one's own actions and conditions, their appraisal and analysis, a regular keeping of a personal sports diary in which the athlete records and analyses the training programme, the results of the competition, tests, self-estimations and other control data. The keeping of a diary, seemingly, an elementary thing, becomes one of the most effective methods of self-education if it is not formal but systematic. With time it becomes a truly creative pastime, similar to research (it is not accidental that thinking athletes call a sports diary a "guide to records").

In general, there are considerably more ways and methods of self-education than we have discussed. The system of self-education of an athlete must touch practically all sides of his training and development.

The entire aggregate of effects on his psyche, ensuring the shaping up of a psychological preparedness for sporting achievement, can generally be called an athlete's "psychological training". But such a broad notion encompasses obviously non-homogeneous phenomena and processes, including much of what has already been discussed—the shaping up of an athlete's motives and assignments, moulding of his psychological properties, will training, as well as the corresponding aspects of intellectual education, sports, technical and physical training, inseparably linked with a directional perfectioning of the psychological processes and psycho-motor functions, etc.

The notion *"special psychological training"* of an athlete has a more concrete sense. It embraces, mainly, those aspects of an athlete's training which are directly related to an operative control of his psychic state, ensuring maximum degree of direct *preparedness for a competition and for performing especially difficult training assignments.* The specific components of psychological training in this respect are as follows: the formation of actual motives and assignments, mobilising the athlete for attaining his goal, operative psychological state, conditioned by the expectation of an important competition (of the "pre-start conditions" type) or "tuning" for a forthcoming training session, as well as self-regulation of the emotional-will manifestations in the course of competition or training, optimisation of the rehabilitative processes and of an athlete's general state by means of "psycho-regulating" effects.

The operative "tuning" for action. Besides the permanent, stable motives comprising the inducing basis of sporting activity, the direct mobilisation for carrying out a difficult training or competitive task is connected with the formation of the so-called immediate or situational motives, motives which are more dynamic and are pre-conditioned by an athlete's changing personal assignments and which depend on the significance of the task set, external conditions of its attainment, the level of the athlete's preparedness and his concrete state (emotional, in particular).

From the motivation factors discussed above, it is clear

that an immediate motive is determined, first and foremost, by the soundness of permanent motives on which it is based. Pedagogically it means that when setting an athlete not only perspective but also immediate tasks, if they are serious enough, the coach must turn, above all, not to temporary interests but to the fundamental motives of sports activity. At the same time it is important to make use of the situational factors, which could intensify the motivation in the given concrete circumstances.

Thus, when planning an assignment for a current competition or training session, in which it is planned to surpass the boundaries reached, it may be intensified, relying on an athlete's personal interests and emotions, connected in the given case with a realisation of the assignment (the desire to reach a qualifying standard to get in a team, setting off for interesting competitions, a desire to affirm one's prestige at a meeting with an opponent, the winner in previous competitions, etc.). To achieve all this the coach must know well the individual abilities of his charges, their interests and know how to find ways to their minds and feelings.

The operative psychological "tuning" of an athlete, besides corresponding actions of the coach, presupposes an active and skilful use of a number of methods of self-concentration and self-mobilisation, which must be initially mastered through special psychological preparation. At present such methods are evolved mainly by perfectioning the traditional methods of "self-tuning" (an inner enticing monologue, going-over the forthcoming action in one's mind, self-orders), mental reproduction of the images calling to life or limiting emotions, and muscular-motor (ideo-motor) notions. Today we have a number of modifications of these methods.

Of interest here is an experience in evolving an ideo-motor warming-up, which at times replaces habitual exercises, and modelling with the help of an ideo-motor methods of all the main components of the programme and of the regime of competitions in combination with the elements of autogenous rest.

Another trend is connected with the objectivisation of the programme of self-tuning and of the methods of controlling its course. This is attained with the help of electro-

nic programming devices of the type of the sensor-motor training stands. For instance, programmes and automatic apparatus for tuning the reactions of anticipation, helping to ensure optimal reaction to opponent's actions, have been successfully used in training high-class fencers.

Regulating psychic states, distinguished for their heightened tension. Many situations in sport, especially typical for important competitions, may cause in an athlete a state of a heightened psychic tension, a kind of emotional or, speaking broadly, psychic stress, long before he competes.

Most widely known of these states are pre-start states of the type of "start fever" or "start apathy". Early pre-start states (several days or even weeks before the start) or pre-start proper or start states (on the day of the start) are distinguished by the terms of manifestation. The former is observed rather rarely. The problem of regulating pre-start states is, therefore, topical, mainly, before the actual competition. However, analogous, although expressed to a smaller degree, states may arise right before the training try-outs and also in connection with the tuning for the forthcoming training sessions especially significant for the perspectives of perfectioning in sport. Moreover, setbacks in competitions and in training sessions, complications of inter-personal relations and a number of other situations, which practically cannot be avoided, are also a source of psychic tension, right up to stress magnitudes.

The tasks of normalisation of psychically-stressed states differ depending on the character of states: in the case of "start apathy" and similar states it is necessary to overcome depression to ensure mobilising readiness, create a confident and optimistic tenor: in the case of excessive excitement—diminish its degree, but not to the detriment of an emotional uplift (a definite degree of psychic tension, is obviously a necessary condition of an athlete's highly resultative actions). Ensuring the emotional stability during competitions and intensive training sessions is part of the tasks of regulating an athlete's psychic states.

The approach to the solution of these tasks must always be a comprehensive one, i. e., based not on any one means or method (at times people naively believe in the existence of certain "magic" methods of self-regulation, as it happened some time ago when people got enthusiastic about

the yoga system). From the pedagogical standpoint we must keep in mind as a minimum the following general factors and individual means, methods and conditions making for a complex influence on an athlete's psychic state.

1. The general factors of an athlete's education and self-education. The following aspects have a special and essential influence on both the entire dynamics of the athlete's development and on his concrete psychic state:

—motivating influence of the coach and his constant moral contacts with the athlete. One of the main general methods of controlling a pre-start state is in forming a clear-cut assignment for a forthcoming competition (or a difficult training session) by a joint working out by the coach and athlete of a system of intermediate tasks and corresponding initial exercises, the subsequent execution of which creates a feeling of confidence in the reality of the assignment;

—the atmosphere of friendship, optimism, purposefulness and efficiency in a sports collective (if there is such an atmosphere, part of the problems of a special psychic preparation is removed by itself);

—a systematic education and self-education of will qualities (without which, understandably, even the most refined mobilisation methods will not help).

2. Special orientation of the means and forms of planning sports training in the aspect of a psychic preparation. In the process of adjustment of pre-start states such an orientation is expressed more often than not in the application of different variants of *specialised warming-up*—"activising" (including, for instance, spurts, imitation of final efforts, highly-dynamic game exercises), "calming" (with the predominance of calm exercises, performed emphatically smoothly, with addition sometimes of emotional exercises, for example with games, so as to produce a necessary "emotional discharge"), as well as exercises "in loosing up", "on attention", "on accuracy" and of special breathing exercises, aimed at reducing general tension, or concentration.

The systematic adjustment of an athlete's psychic state with the help of training factors is ensured, however, not so

much by individual exercises as by the general structure of the training process—optimal alternation of loads and rest, rhythmical alternation of the preferential directiveness of training sessions within the framework of small, average and big training cycles.

3. Adapting to the conditions of competitions and adjusting the psychic tension resulting from competitive loads. Rationally organised competitive practice also belongs to the general condition of optimisation of pre-start states and the moulding of an athlete's psychic stability. There must be a sufficient number of preparatory and competitive sports competitions proper in each big training cycle, allowing an adjustment to competitive loads and conditions. At the stage of the direct pre-start training series starts of a control character with a gradual increase of psychic load are practised more and more widely.

Although it is difficult to measure precisely the psychic aspect of the competitive loads, the methods of its ranging and expedient alteration are found experimentally. Of interest, for example, is the experience of evaluating psychic tension of the competitions in points and their distribution depending on degree in the training cycles. This method is successfully used for many years in training high-class fencers.

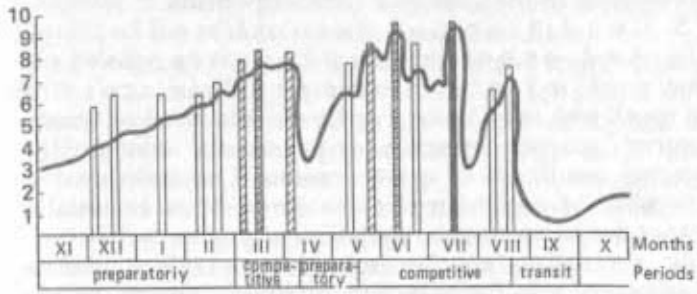

Fig. 8. **The example of the practical evaluation of the dynamics of the physical tension of the training and competitive loads in the best fencers.**

To increase the degree of an athlete's psychic stability in complicated competitive circumstances, situations approaching stress situations (for instance, suddenly postponing a

previously planned try-out for a day or making the regime and external conditions more complicated, etc.) must deliberately be created during preparatory competitions. It is important not to exceed the measure of difficulty within the athlete's strength ability, a thing demanding from the coach professional art and a developed feeling of measure.

4. Special methods of psychic adjustment and self-adjustment. They are represented by the "psycho-regulating training" (including "autogenous training"), ideo-motor exercises and similar methods, already mentioned above. In the last few years the "psycho-regulating training" (PRT) has undergone detailed development.

It includes a complex of methods of suggestion and self-suggestion, directed, on the one hand, at "calming" (removal of excessive psychic tension, relaxation and general rehabilitation) and, on the other–at "mobilisation" and activisation, going over to a cheerful and active state. The experience of combining PRT with the ideo-motor exercises and of forming the needed assignment towards a concrete competitive situation is being accumulated. If the PRT is used in a qualified way, it serves as quite an important factor of an athlete's special psychic training; especially when all other methods turn out to be insufficiently effective. Athletes who have mastered PRT methods make use of its elements in the course of the competition.

5. Conditions of natural media, hygienic and other media factors, assisting the optimisation of a psychic state. Here we speak not only about a quite obvious need to constantly observe general hygienic requirements concerning the external conditions of sports sessions. The directional use of a number of natural media factors is of an essential significance for an operative regulation of psychic states.

In particular, coaches sometimes conduct sessions in emotionally comfortable and other conditions of natural media and sports facilities, artificial aeroionisation (its effect on the psychic functions may now be regarded as proved), hydrotreatment, sauna, colour gamut in the illumination of the facilities where the session is held, skilfully chosen musical accompaniment, etc.

Certain other aspects of psychic training, which in fact

are inseparable aspects of the intellectual, technical, tactical and physical preparation will be discussed in the corresponding section of the present course.

Chapter Five

Intellectual, Technical and Tactical Training in Sports

1. INTELLECTUAL PREPARATION

The aspects of an athlete's intellectual preparation cover everything that is directed at the comprehension of sport activity proper, the phenomena and processes directly connected with it and at the development of intellectual abilities, without which the attainment of considerable aims is unthinkable. Intellectual preparation is directly related to the formation of the rational foundations of the athlete's motivations, his will and special psychic preparedness, teaching him sports technique and tactics and perfectioning of his sporting skill. It is closely linked with the moulding of physical abilities. Two main aspects of intellectual preparedness of an athlete are of essential importance in all these respects: his intellectual education and the moulding of his intellectual abilities.

Athlete's intellectual education. The following are the main aspects in the complex of knowledge which make up the content of the athlete's intellectual education:

a) knowledge of the world, motivating and sports-ethical character, i.e., knowledge which assists the formation of a correct outlook on the world as a whole, enabling him to grasp the general essence of sports activity, its social and personal significance for an athlete, to shape up rational foundations of stable motives and principles of behaviour;

b) knowledge making up the general scientific foundation of the athlete's preparation (general principles of sports preparation, natural scientific and psychological grounds of sports activity and so forth);

c) sports applied knowledge, including information about the rules of sports competitions, technique and tactics of the selected sport, criteria of their effectiveness and ways of mastering, means and methods of physical, will and special psychic preparedness, rules of planning a training session,

extra-training factors of sports training, requirements towards the organisation of a general life regime, ensuing from the conditions of sports activity, the rules of self-control, material and technical conditions of engaging in sport, etc.

This knowledge is concentrated in specialised scientific disciplines, which have taken shape in the sphere of sport (general foundations and partial branches of sports theory and methods), as well as in specialised branches of the general humanitarian, natural and related disciplines, orientated towards the cognition and scientific provision of sports practice. They comprise in a didactic form a subject of the athlete's theoretical education. Systematic education and self-education, deepening in the process of many-year perfectioning in sport, becomes a decisive condition of creative manifestations in sport. Besides the sport and applied training, an athlete's theoretical preparedness in the Soviet sports school has a broader aim. The determining aspect in it is to help an athlete in the shaping up of his scientific world outlook.

Theoretical knowledge is passed on and mastered in the process of the athlete's preparation, mainly, in the form of lectures, seminars, colloquia, reading, etc. Directly in sports training, knowledge is presented with the argumentation by the coach of training assignments and with the shaping up of a comprehensive approach to them, with the control of the course of their realisation and analysis of the results of their execution. The possibilities of presenting an unfolded system of information here is limited due to understandable reasons (dynamics of the training process and so forth). Therefore, the system of theoretical knowledge organised in connection with training, guidance of self-education and instilling cognitive interests, is of prime importance in the athlete's intellectual education.

In guiding the athlete's self-education it must be taken into account that his evaluation of the significance of various theoretical data for perfectioning in a sport not always coincides with the coach's evaluation and its objective meaningfulness. Judging by the materials of mass research many athletes especially at the first stages of their sporting road tend to appraise highly their relatively partial knowledge, directly connected with their immediate sports interests. Such utilitarianism if it becomes the main line of

theoretical preparation, impoverishes its content and the essence of engaging in sport. Helping an athlete to satisfy his narrow utilitarian requirements in knowledge, the coach must raise them to broader cognitive interests and, relying on them, lead an athlete to a deeper cognition of the general essence of sporting activity as a factor of the all-round development of a personality.

Moulding of the intellectual abilities answering the specific requirements of the chosen sport. It is known from the general theory of education that the development of the intellect's qualities (its breadth, depth, inquisitiveness, critical attitude, vivacity and others) is conditioned not only, and at times not so much by the accumulation of knowledge, as by practical activity, demanding creative manifestations. Sports activity in its various forms demands, so far as it can be judged by the data of modern sports and psychological research, specific intellectual abilities, in particular, so-called operative tactical thinking (in sports games and encounters), the ability deeply to analyse and construct the models of new forms of movements (in gymnastics and similar sports), and so on. The instilling of intellectual abilities, answering the specifics of the chosen sport, together with the educational side makes up the main content of the athlete's intellectual preparation.

In the process of sports training the instilling of intellectual abilities has a concrete objective: the study and perfectioning of sports technique and tactics or, to be more exact, the solution of tasks of a creative character and similar tasks in the special psychic, will and physical preparation. This does not mean that problems of the direct influence on the development of intellectual abilities in the course of training do not assume independent significance. The motor activity characteristic of the training process in itself does not engender high intellectual activity, just as the conscientious following of training assignments, worked out by others, does not guarantee the development of intellectual creative abilities. To acquire them the athlete needs, as well as everything else, a system of special knowledge and methods of the organisation of training sessions, which would impel him to increasing creative manifestations—from the initial forms of self-analysis and search to the solution of truly complicated tasks, connected with the creation of

new variants of movements, technique, evolvement of an original tactics of the competitions and perfectioning of training methods. It is precisely this that must become a pivot of instilling intellectual abilities in sports training.

Modern approaches to the optimisation of the ways of intellectual education of an athlete are orientated not so much at individual methods as at the evolvement of integral programmes and methods based on the principles of the consequential unfolding of cognitive activity with an increasing degree of the athlete's activity in the solution of the tasks and an objective control of the results of these solutions.

2. SPORTS TECHNICAL PREPARATION

2. 1. The Tasks and Content

Definition of notions. The teaching of an athlete the fundamentals of the technique of actions executed during competitions or serving as a means of training and the perfectioning of selected forms of sports technique is called *"technical preparedness"*. Just as in other kinds of teaching, the technical preparation of an athlete is a process of control in acquiring knowledge and skills (in this case of knowledge and skills related to the technique of motor actions). Applied to it are the general didactic principles and didactic propositions of the methodics of physical education. The specifics of the sports and technical training are determined by the fact that they are based on the requirements of attaining mastery in the selected sport.

When speaking about "sports technique" we must distinguish between two meanings of this term. Firstly, an ideal "model" of competitive action (mental or in words, in graphic, mathematical or any other form) evolved on the basis of practical experience or theoretically; secondly, the method of executing a competitive action being formed (or already formed) which is characterised to this or that degree by the effective use by an athlete of abilities for achieving a sporting result. To avoid mixing up these notions, it is best to use in the first case the term "model of sports technique". Sports technique as a method of executing

competitive actions is directly linked with sports tactics, by the general method of unification of the aggregate of given actions for the sake of attaining the competitive goal, (i. e., the form of organisation of the competitive activity as a whole). The differences between these notions are not absolute. During competition sports technique is practically inseparable from the tactics. This finds expression in the notion of "technical-tactical actions".

The existing views on sports technical mastery are linked with the surmise that in the process of perfectioning in sport an athlete's technique must approach a certain ideal, reflecting the most effective methods of execution of sports actions. True, the search for the standard of an ideal technique led so far to finding only certain biochemical regularities of sports actions. Both the coach and the athlete are faced with the problem of evolving and correcting the concrete models of sports technique which should correspond to the athlete's morpho-functional specifics and planned achievements. The real forms of action, mastered by the athlete at the beginning of his sporting road, cannot fully coincide with the models of technique useful at consequent stages, since the technique of movements is decisively determined by the degree of development of the athlete's physical and psychic qualities, regularly changing in the process of his perfectioning in sport. The forms of individual technique must change correspondingly with these changes. This means that an athlete's technical preparedness has no ending. It is implemented throughout his entire sports activity.

The most general criteria of the effectiveness of sports technique is determined by the difference between the actual sports result and the rated result which the athlete could have shown if he used his physical abilities to the maximum. A number of measuring and rating procedures have been evolved for the quantitative appraisal of the degree of perfection of technique. These are used in cases when it is impossible to measure sports result objectively. The technical effectiveness ratio, for instance, is calculated by the formula:

$$\mathrm{TER}=\frac{W}{h}$$

where W—the athlete's motor potential, found through special tests and calculations, h—rated sports index. Evidently, the more the athlete uses his motor potential, the more perfect is his technique.

Use is also made of a sufficiently great number of partial indices of technique effectiveness in individual sports such as, for instance:

in weightlifting—the height of lifting the bar at the moment of squatting (all other conditions being equal, the smaller the height, the more "technically" the weightlifter executes a given phase of the exercise);

in long-distance running—the ration of the useful and support phase of the running step or the ration between the frequency and length of steps;

in acrobatics—the time difference in flight when performing simple and complicated acrobatic jumps (the smaller it is, the better the technique).

It is more difficult to determine the general effectiveness in sports, the results of which are not measured so far by objective quantitative measures. Expert evaluations are used here for judgement (for instance, in points) along with rated evaluations, introduced by the partial indices of the result of actions in competitions (for instance, attacking actions in games and encounters), as well as by the biochemical analysis, based on the comparison of separate parameters of the technique of movements with standard values, and by other methods.

The indices of the reliability of technique, volume (quantity) and diversity of technical methods mastered also serve as a criteria of the sports technical skill. The percentage of successful and unsuccessful attempts in the general number of attempts can serve as a simplest index of the reliability of technique used by the athlete in competitions or in try-outs so as to achieve the highest result planned.

The tasks and stages of an athlete's technical training. The main task in sports technical preparation is to form such skills in performing competitive actions as would allow the athlete to use his abilities in competitions with maximum effectiveness and ensure a steady perfectioning of his technical mastery in the many-year process of engaging in sport. This definition encompasses many tasks: cognition

of the theoretical fundamentals of sports technique (this belongs to the number of basic tasks of theoretical preparation); modelling of individual forms of the technique of movements corresponding to the athlete's possibilities; shaping up of the skills and habits necessary for successful participation in current competitions; subsequent restructuring and renewal of the forms of technique (to a degree dictated by the requirements of sports perfectioning); creation of the principally new variants of sports technique no one used before at a sufficiently high stage of sporting mastery, etc. All this mainly belongs to the content of special sports technical preparation.

The versatile preparation of an athlete including general technical preparation which above all presupposes the replenishment (or restoration) of the accumulated skills and habits is the prerequisite of forming technical skills in the selected sport, ensuring the necessary premises for realisation of given tasks. Wide use is made of the effect of the positive transfer of skills: skills formed in the process of general preparation are part—usually in the transformed state—of the specific skills arising on their basis and promote their perfectioning (as for instance, a number of gymnastic skills in forming the skills in pole vaulting, diving, figure skating). The athlete's general technical training includes also the teaching of the technique of exercises, selected as additional means of physical preparedness (it is clear that before using this or that exercise as a means of instilling physical qualities one must learn to execute it correctly). Besides mastering the skills, an essential part of this stage must be the instilling of coordinating abilities on which the degree of sporting and technical perfectioning depends decisively.

The main peculiarities of setting and realising the tasks of technical preparation in various sports ensue from the specific requirements to necessary skills and habits, their properties (stability, variativeness and so on) and correlations of the technical preparedness with other aspects of the athlete's preparedness.

Thus, when specialising in a monostructural sport, the same (in the main) competitive exercise (jumping, shot putting, running the selected distance, etc.) is an object of thorough technical perfectioning over many years. One of

the most difficult tasks here is a periodic transformation and renewal of the forms of movements which become firmly embedded so as to bring them in tune with the increasing level of the athlete's physical preparedness. The athlete's technical arsenal is practically unlimited in all polystructural sports (excluding dual- and multi-event competitions with a permanent competitive programme). It is being renewed either by the conditions of the periodic change of the compulsory programme of competitions (in gymnastics and similar sports), or on one's own initiative.

2.2. The Fundamentals of an Athlete's Technical Preparation in the Training Process

2. 2. 1. Initial Remarks

Means and methods. The complex of means and methods used for realising the tasks of the technical preparation in the process of sports training has been discussed in general in the introductory characteristics. The main practical means of the athlete's technical preparation are the preparatory exercises which have an essential structural community with the competitive actions, the training forms of the competitive exercises and the competitive exercises proper with the peculiarities adherent to them.

Many varieties of the exercise methods (methods of dismembered-constructive and integral exercise with a selective separation of details, standard-repeating and variable exercises, etc.) are combined in a definite order depending on the specifics of the selected sport and stages of technical preparation.

The traditional means and methods of oral and visual teaching in modern methodics of any athlete's technical preparation are being replenished every year with new ones. In most cases they are linked with the use of specialised apparatus for forming visual notions, programming movement parameters, prompt objective information as exercises are being performed and correction of errors or facilitation of the correct execution of actions.

The stages of physical preparation. Generally the many-year process of an athlete's technical preparation may be divided into two main stages: 1)the stage of basic technical

preparation and 2) the stage of a more thorough technical perfectioning, mastering the heights of sports technical skill. The first stage includes the initial teaching of sports technique and expediently constructed sports preparation, forming a rich collection of sporting and technical skills, based on which the technique of the selected sport is perfectioned further on. Teaching in the direct meaning of the word is expressed most fully at the first stage. However, at the second stage it continues to be one of the main aspects of sports preparation. Only its concrete content and form change.

The process of technical preparation at the second stage of teaching is subordinated to a considerably greater degree than at the first to the logic of precise periodisation in the training process. It means that new forms or variants of technique, their instilling and perfectioning, are mastered dependent on the requirements of the acquiring, preserving and the further development of sports form within the framework of big training cycles (annual and semi-annual). The stages of the technical preparation in each such cycle must correspond to its general structure. The logic of expansion of stages of technical training tells on the general structure of the training cycle. A progressing athlete has at least three stages of technical training in each cycle.

First stage. It mainly coincides with the first half of the preparatory period of big training cycles, when the entire preparation of an athlete is subordinated to the necessity of creating (expanding, improving) prerequisites for establishing sports form. In technical preparation this is the stage of "constructing" a model of a new technique of competitive actions (or its renewed variant), bettering its prerequisites, practical mastering, studying (or studying anew) of certain exercises being part of the competitive actions, and of shaping up of their general coordinating basis.

Second stage. At this stage technical preparation is aimed at a thorough mastering and instilling of aggregate skills of competitive actions as components of sports form. It encompasses, as a rule, a considerable part of the second stage of the preparatory period of big training cycles (special preparatory stage).

Third stage. The technical preparation at this stage is being constructed within the framework of a directly pre-competitive preparation and is aimed at perfectioning the acquired skills, expanding the range of their expedient variety and a degree of "reliability" as applied to the conditions of the main competitions. This stage usually begins with the concluding part of the preparatory training period and is taken to the competitive period (period of the main competitions). In case of the great length of the latter, technical training in the main retains the traits characterising it at the third stage and only partially changes depending on the specifics of the structure of the competitive period.

The individual requirements to establish his sports mastery, the specifics of the selected sport, the general structure of the training cycle and other factors influence the content and form of the athlete's technical training. Therefore, in practice we have different variants in its planning.

Thus, if the athlete's technique in the given training cycle is not subjected to essential transformations and the technical preparation boils down mainly to an insignificant improvement of skills acquired earlier (which often happens in the training of athletes who wind up their sporting career), the boundaries between these stages disappear and the duration of the first stages is diminished. When there is a necessity to restucture the firmly instilled skills and deeply rooted technical shortcomings, on the contrary, the first stage must be prolonged by introducing a unique "readaptation" stage (usually coinciding with the transitional training period), when these skills are not used in action. This facilitates the "extinction" of the undesirable conditionally reflex links over a period of time.

It must be taken into account that the above-mentioned stages are singled out only relatively to the main object of the athlete's technical preparation—the technique of competitive actions. Actually the process of technical preparation is always "laminated": certain new skills (or their elements) are formed simultaneously with the destruction, transformation, stabilisation and improvement of others.

2.2.2. The Specifics of the Methods of the Formation of Skills in Establishing New Sporting Technique (or in its partial renewal)

The transformation of skills which no longer promote the growth of achievements and the formation of new skills corresponding to the final goal are the main tasks in the technical preparation of a progressing athlete, to be tackled in the first half of the training cycle.

The degree of difficulty of the tasks and prerequisites for their solution. Naturally, when setting tasks connected with teaching it is necessary to correlate the degree of their difficulty with the real possibilities of their solution. The degree of difficulty of such tasks in an athlete's technical training depends, on the one hand, on the level of his initial preparedness and, on the other, on the novelty of the formed skills, their number and the degree of transformation of the skills mastered earlier.

As is known, an athlete has to master the greatest number of new skills in polystructural sports. In monostructural sports where the competitive exercise remains the same in the course of a number of big training cycles, the complexity of the tasks of technical preparation is determined greatly by the difficulty of restructuring of firmly instilled skills and going over to new variants of technique corresponding to the growing level of the athlete's preparedness. Most complicated tasks arise when the athlete reaches the highest level of sporting perfectioning, when the coach and the athlete try to create new forms of technique which have no direct analogues in the present technique. In such cases the modelling of technique and the search of the ways of practical incarnation of the model assume the character of a creative problem. The more complicated the tasks, the more weighty prerequisites are required for their solution.

Despite the fact that as the training record raises and the level of preparedness of an athlete, in general, increases, this does not remove the problem of his optimal potential for learning the new. On the contrary, the problem in a certain sense becomes more acute because with the growth of sporting mastery the forms of technique become more and more complicated and sporting perfectioning passes over to the field of searching for principally new forms, while the

biological prerequisites of the development of ability for transformation of the mastered forms of sport actions, obviously begin to worsen with the onset of a definite age.

That is why, irrespective the athlete's qualification, it is necessary to create as favourable prerequisites for its progressive changes as possible in every big training cycle.

The most important of such prerequisites lie in increasing the level of the athlete's physical and psychic preparedness, instilling his coordinating abilities and those linked with them, as well in replenishing the store of motor skills, facilitating the establishment of new forms (variants) of the competitive actions. Since the latter cannot be formed without relying on the preceding motor experience, technical preparation at the first stage of the training cycle is characterised by a consecutive transition from the initial to partial skills and from them—to the integral structures of competitive technique. However, since the athlete's physical preparedness does not correspond to the planned final achievement, there is no sense in forcing the establishment of new forms (or variants) of technique of competitive actions in their integral form, since their qualitative characteristics will turn out to be inferior.

The formation of the orientating basis of new competitive actions. The modern psychological research of the study process emphasises the primary role of its orientating basis (initial images-notions which form in an athlete about the content, methods and conditions of performing an action) in the establishment of the action.

The specifics of forming the orientating basis of the competitive actions of a qualified athlete are preconditioned, firstly, by the fact that the image-model of a new (or renewed) technique created by him from the very outset is based on the earlier acquired motor experience. Secondly, if the form of the actions is actually new (has not direct analogues in existing sporting practice) it initially cannot be observed in its natural state (as an external object of observation). That is why it has to be presented only in the form of a model (mental, graphic, etc.). The first circumstance may make the instruction easier or more difficult—depending on how the motor skills mastered earlier and formed anew are linked between each other—by the type of the negative or positive transfer.

The second circumstance demands the search for special methods and means, which would permit forming a relatively full orientating basis of a new action, despite the fact that an athlete may have no factual information about it.

Such methods and means are evolved at present in several directions. Alongside methods of the theoretical working-out of a model of action use is made of various methods of graphic depiction of movements, methods of modelling of spatial parameters of movements on models and mechanical models (for example, on the model of the system "gymnast's body—gymnastic apparatus"), speed, tempo and rhythm with the help of electronic apparatus (light-pacers, sound-pacers, rhythm-pacers, etc.). But the orientating basis of the motor action remains incomplete until real muscular-motor feelings and notions arise. Selected in a qualified way, approaching exercises, directed "feeling" of movements on special training stands and other devices with the introduction of reference points in an action situation and then—after forming initial notions—ideo-motor exercises help to form them at the first stage.

The ways of practical studying. At the first stage of an athlete's technical preparation when a new (or renewed) technique of competitive actions is being formed, methods of the dismembered-constructive exercise, as a rule, predominate. Integral competitive exercises are performed as if in a dismembered form, singling out their phases, with a subsequent unifying of parts into one single whole.

More often than not exceptions happen in sports of a cyclic character, where the natural fusion of movements prompts preference to the methods of integral exercises. However, at present in this type of sport too an approach is practiced more and more widely connected with the use of imitative and other special preparatory exercises.

The following propositions are of importance for concretising the general rules of studying motor actions.

1. Exercises directed at the formation (transformation) of competitive actions "in parts", must not by their main structural indices essentially differ from the reproduced "parts" of the competitive exercise (a sufficiently qualified

analysis is needed to become convinced in it).* If this condition is not observed, the preparatory exercise will be formed not as a skill of competitive actions, but as some other skill. This may cause interference (negative transfer) of skills. The danger of distorting singled out parts of a complex competitive exercise is lessened when it consists of relatively independent elements (elements and liaison movements of gymnastic combinations, game combinations, methods in encounters, etc.), which figure in the process of a technical training as "whole" or "parts" of a more complicated whole.

2. The order of the formation or restructuring of the phases (operations) of a competitive exercise depends on the peculiarities of its structure, as well as on an athlete's preparedness, including the motor experience acquired by him. In principle, the more an athlete has "ready" forms of coordinating movements, which will be part of a new (or transformed) skill, the less is the share of the dismembered exercise in the process of the formation of a new skill. If there are shortcomings in the execution of the initial phase of the action, they, naturally, must be eliminated first of all. It is expedient within the boundaries of the phases being executed, first of all, to form or specify concrete motor tasks, boundary–"input" and "output"–positions (initial and final stances in the support body position, interrelation of the links of the motor apparatus), and then–a method of transfer from the initial to the final position.

3. Regardless of the fact whether the given action is being studied preferentially in parts or as a whole, an athlete must at the first stage learn to control and correct movements "operation by operation" (at first visually, then kinestetically, without the participation of vision). For this purpose it is necessary to know the main "control points" in each phase (positions and inter-positions of links of a motor apparatus, etc.). Phase-by-phase formation of the actions allows the overcoming of difficulties of self-controlling quickly-flowing sports actions, especially when the methods

* For instance, sprint or an approach run (at a similar section of distance) in long jumping are, seemingly, structurally adequate exercises, but a detailed analysis showed that they have an important technical difference.

of the objective "express information" are used in parallel.

4. It is expedient to instil the skills of dismembered execution of the competitive exercises only when there are no serious obstacles in unifying them into a single whole. Here much depends on how organically they link up with each other. In gymnastic combinations, for instance, the danger of an excessive instilling of these elements as separate skills is relatively insignificant but when the phases of monostructural exercises are separated (jumps, discus throwing, etc.) it is much greater. In case of a natural continuity of the competitive action separate parts must be linked up at the first opportunity and mastered against the background of the whole, with a selective isolation of details (as the necessity arises).

A number of methodological methods helps to counter the isolation of separate parts of a skill: regular recreation of an integral image of the action being formed on the basis of a preliminary worked-out model (graphic, mechanical, etc.)–and then in the form of ideo-motor notions with accent on the general rhythm of movements; use of integral imitation exercises; varying execution of the isolated parts (from different initial positions and at different end positions, by various methods, etc.).

5. At the first stage successful realisation of the tasks of forming a new technique of the competitive actions and transforming old skills is largely determined by the use of the methodological approaches and methods, facilitating technically-correct execution of exercises, especially when they are distinguished for their coordinative complicatedness and linked with the ultimate efforts of a speed-strength character. Besides the methods of dismembering of an exercise "into parts" and direct physical assistance of the coach, this aspect of training includes many special methods: use of sports training stands, lightened training apparatus and specialised gear (suspension ropes, jump bridges, trampolines, inclined cinder tracks, running, rowing and swimming treadbans, etc.).

The main methodological question in lightening training sessions is its optimal rationing because excessive lightening leads to the formation of a skill which does not correspond to the specifics of competitive exercises. Quite understandable from here is the ever-growing attention to making the

"teaching" training stands and other devices with a rationed application of external mechanical forces and limiting conditions, which help the athlete to observe given movement parameters (training stands for learning and improving rotating movements in gymnastics, ultimate efforts in throwing, pushing off in jumping, spatial parameters and coordination of movements in swimming, rowing, skiing, skating, etc.)

Forming a rhythm as a pivot in technical preparation. The most important complex characteristic of the technique of an integral sports action is, as is known, its rhythmic character, which expresses a regular order of unification of all its components. The formation and optimisation of the rhythm of competitive actions is, in essence, a central problem of the entire technical preparation of an athlete connected at the same time with the tasks of moulding his coordinating abilities, perfectioning the precision of movements in time and space, the ability optimally to regulate muscle tension and loosening up.

Since an athlete initially has no rhythmic structure of the newly formed complex actions in a ready form, it is important to create a notion about the standard rhythm. When the action technique is not principally new, this task is resolved by methods such as the demonstration of examples of the technically-perfect execution of the action with the attention concentrated on its rhythm, cine and video tape recorded demonstration at normal and at slowed down speed with sound accompaniment reproducing the measured tempo of movements, reproduction of the rhythm by given example with voice (rhythmical count), imitation movements (beating the rhythm), ideo-motor notions, etc. The standard rhythm of new movements is created, by analogy with the rhythmic structure of new movements of known forms, changing it in a rated way on the basis of reference outlines or analytically.

The problem of individualisation of the rhythm of movements arises immediately as soon as the notion about standard rhythm is created, since the latter cannot fully correspond to the individual rate of movement. The rhythm is individualised by way of its controlled reproduction by an athlete (at first mentally in combination with oral and motor imitation and then in the process of an integral

execution of formed actions with an objective evaluation of movement parameters and their general effect).

Settings in the process of the formation of competitive action technique and its intensity. A psychomotor assignment for an athlete executing newly-formed or transformed competitive actions shifts, as the skill is developed, from the initial preferable concentration on details to concentration on decisive phases, to qualitative specifics of the expended efforts and the task of timely correction of the actions in the changing situation. It is expedient to introduce more concrete assignments in combination with a general setting at an optimal regime as an integral action is being formed corresponding to the specifics of strength, speed and other characteristics, upon which all the structure of movements in the selected sports depends. It has been found, for instance, that the setting "at the force of push-off" in long jumping adversely influences the kinematic characteristics of the main phase of a jump, whereas the assignment "at speed" facilitates their optimisation.

In connection with the coordinating difficulties and incompleteness of the athlete's physical preparation the intensity of the formed actions in the first half of the training cycle is rated in a way different from the subsequent stages. It is recommended to execute the actions being formed in the speed-strength sports with so-called controlled speed-high but not greater than the one at which the athlete can control the correctness of movements. Practical experience and a number of research works give ground to assume that at the first stage the intensity volume of the most of exercises executed without training stands and external extra weights must make up less than 90 per cent of the maximum intensity calculated from the ultimate result. In sports which do not demand ultimate speed and strength abilities (long distance running, for instance) the technique of movements at the beginning of the training cycle may be formed as applied to the speed and tempo parameters and the degree of efforts necessary for showing the planned result. But this presupposes the division of the competitive exercise into parts (or the reduction of the duration characteristic for it) a thing that qualitatively alters the regime of identification of endurance.

Training session regime. Technical preparation in the first

stage of a big training cycle is great in volume. Determining under these conditions the expedient frequency of sessions, aimed at the formation of new forms of coordination of movements and the volume of work, coaches are usually guided by the rule "better more often, but little by little". A sufficiently high effectiveness of the work of forming and restructuring of complicated sporting and technical skills, evidently, in most cases is ensured by daily sessions, each of which includes in itself such work in a relatively small volume. Its effectiveness considerably lessens with a growing number of the intervals between sessions, even in case when the volume of work at a training session increases.

The effectiveness of exercises "for technique" is determined not by the volume of functional shifts, resulting in fatigue, but by the correctness and accuracy of the forms of coordinating movements being worked out. That is why the number of repetitions in these exercises at the first stage is relatively small and is limited in the course of a session, as soon as there is a danger of technical errors being instilled. The rest intervals between the repeated attempts in the given section of the sessions (usually it is the first half of the main part of the training lesson) is not limited rigidly so as to give the athlete time to tune himself optimally at the solution of complicated coordinating tasks.

Unification of technical and physical preparation. Physical preparation at the beginning of the preparatory cycle in its effectiveness outstrips the course of formation (or transformation) of the technique of movements. The general level of physical preparedness increases with an especially high tempo while the level of the technical preparedness is inevitably limited by the fact that the new (or renewed) skills are still being formed. A big volume of physical loads, characteristic for this stage may for a time make the formation of the skills more difficult.

To exclude an excessive "divergence" of the effects of the technical and physical preparation, the coach must, first of all, ensure an optimal distribution of loads, connected with these aspects of training (both in the structure of individual training sessions and by stages on the whole); secondly, he must use special methodological approaches facilitating organic unification of the physical and technical preparedness. The "principle of a direct

conjugation" expresses a general idea of the approach. It presupposes, in particular, the drawing of the method of executing preparatory exercises, which serve as the means of moulding physical abilities, closer to the specifics of the technique of competitive actions being formed; the execution of exercises including earlier formed competitive actions (or their elements) with additional weights which intensify the effect of a single action on the development of the motive skills and qualities.

An elementary example of the first approach—execution by shot-putters of preparatory exercises with the bars, the muscle efforts regime which approaches the dynamic characteristics of movements in shot-putting (pushing up the bar lying on the training stand, jumping up from the semi-crouched position with the bar on the shoulders, etc.); an example of the second approach—exercises in throwing extra-heavy weights (javeline throwers—2-4-kilogramme shots) or in ball throwing for accuracy (basketball) with extra weights on the wrists (1.5-2-kilogramme lead cuffs). Of principle importance in such an approach is the choice of extra weights so that they do not distort the structure of movements.

2. 2. 3. The Specifics of the Method of Stabilisation and Perfectioning of the Skills Formed

The determining direction and partial tasks. As the preparatory period is completed, as well as in the competitive period of the big training cycle, tendencies leading to the stabilisation of competitive skills and the achievement of an expedient degree of their variety are intensified in an athlete's technical preparation. These tendencies presuppose opposite and at the same time internal interrelated methodological approaches. The tasks of specification and relative instilling of technical characteristics are resolved first of all at the level of special training and then—the tasks of ensuring a necessary variety and a high "reliability" of the technique of actions as applied to the specific conditions of competitions.

Ways and conditions of the initial stabilisation of skills. The formed methods of technical execution of competitive

actions initially are not distinguished for their high stability. This is expressed in the unforeseen deviations of the movement parameters when they are being reproduced even in relatively standard conditions. In this connection one of the prime tasks at the second stage of technical preparation is the stabilisation of newly-acquired and changed forms of movement coordination.

The formed skills are stabilised quicker when the system of the forming effects is reproduced often and relatively stereotypically. Proceeding from this, the methods of standard and repeated exercises are used as main ways of the initial stabilisation of skills. As is known, they are characterised by a multiple execution of the formed action in relatively permanent conditions with an assignment at a possibly smaller deviation of movement parameters from the chosen sample.

The rules of expedient methods of the stabilisation of sports skills are determined, in particular, by the following propositions.

1. A skill is stabilised the easier, the more standard the instilled traits are reproduced in the process of the repeated execution. Hence the rule: factors leading to deviations from the optimal parameters of the movement technique (difficult conditions of the external medium, fatigue, psychic tension, "competition" of old skills, etc.) must be excluded at the beginning of instilling the skill of the integral execution of actions and conditions created for lessening the possibility of such deviations (by regulating loads and rest, distribution of exercises in the structure of sessions facilitating the instillment of skills, use of proper training stands, pacing devices, standardisation of the conditions of the external medium, etc.).

2. Efforts aimed at the stabilisation of the skills, understandably become useless if mistakes and imperfections are instilled in the process. In other words, a positive character of stabilisation must be ensured. Therefore, the standard character of the exercises is relative: they should be repeated without repeating the mistakes and with the specification of the instilled movement parameters. At this stage of stabilisation, just as at all other stages, technical preparation has to be combined with the moulding of an ability to precisely differentiate and regulate special,

time and dynamic movement parameters, to rationally alternate muscle tensions and loosening and to control variable moments of action as a whole.

3. It is expedient to affix competitive actions in so as to give them the necessary stability but not turn them into fast-set stereotypes and to coordinate them with the general tendency of the development of the degree of training at the given training stage. Different degrees of the skill stabilisation and their components is required, as is known, in different sports.

In gymnastics and in similar sports with a relatively standard kinetic structure of competitive movements which changes but little with the change of the degree of training, the degree of the skill stabilisation on the whole is considerably higher than in any other sport. In this case the skill stabilisation is the main tendency of their perfectioning both during the stage being discussed and in latter stages of the technical training and embraces the entire set of exercises envisaged by the competitive programme. The basis (main phase) of technical methods is, mainly, stabilised in sports games and encounters. "Entering" into a set motion and "coming out" of it (initial positions and preparatory actions for an attack, concluding shots, throws, actions of changing over to another motion, and so on) also must be affixed but with the retention of a sufficiently broad range of varieties of these skills.

4. As the formed skills of the competitive actions are being affixed, all the movement parameters of exercises, ensuring stabilisation, must gradually approach the ultimate (adequate to the sports achievement planned for the given training cycle). The problem of skill stabilisation in speed and strength sports is moved to the foreground in conditions of ever growing speed and strength manifestations.

Thus, if at the first stage the exercises without extra weights were performed with an intensity not exceeding 90 per cent at the stabilisation stage, the intensity of the major part of these exercises shifts at first into a 90-93-per cent range and then close to the competitive one. When skills are being affixed in sports which do not require ultimate manifestations of speed and strength abilities, there is every reason immediately to ensure the stabilisation

of the main traits of the movement technique as applied to the ultimate level of their intensity.

Methodological approaches and methods directed at the expansion of the range of variety of skills. The reliability of sports technique depends also on the possibility of changing the formed skills correspondingly to the changing conditions of competition, and, therefore, on the range of skill variety. In this connection we must recall that skill stability and dynamics represent not only opposite but also interrelated properties. Their interrelation is seen, in particular, in the fact that the given kinematic parameters of an action may remain unchanged when it is executed in different conditions.

Expedient variety of the technique of competitive actions is characterised by their justified changeability, which is adequate to the conditions of competitions and facilitates the preservation of the effectiveness of actions. It allows deviations from the instilled forms of movements, but not more than it is necessary for achieving the competitive goal. The range of such variations, as it has already been said, is different in different sports. One of the main tasks in technical training of an athlete when he perfects the instilled skills is to ensure the variety corresponding to the specifics of a particular sport. This is achieved by a direct variation of individual characteristics, phases and forms of exercises, as well as the external conditions of their execution.

The initial basis of variation lies in the combination of a permanent setting at the effectiveness of competitive actions and expediently-changed operative settings in training. The concrete content and degree of the variation of the operative settings depends on the specifics of sports and athlete's abilities.

The broadest range of justified variations of the operative settings is typical of sports with non-standard composition of competitive situations (sports games and encounters). In fencing, for instance, the effectiveness of competitive actions depends on how widely used are exercises in training with varied settings for speed, accuracy (of movements), forestalling (anticipation of the opponent's actions) and switching over (immediately after the end of the action or in the course of it), in basketball—exercises with the settings

for speed, stability, height of the trajectory (ball flight), distance of throws, etc.

In the methodological aspect we must distinguish two types of approaches and corresponding particular methods directed at the expansion of the range of variety of the instilled skills: 1) strictly controlled variation, when its direction and degree are strictly prescribed by the training assignment, reflected in a corresponding goal of an athlete and ensured by a precise regulation of external influences; 2) loosely regulated variation, when the realisation of the given setting for variation depends on unforeseen changes in external conditions.

1. Methods of the strictly regulated variation include the execution of assignments requiring the ability to change individual movement parameters, as well as their links and forms of coordination within strict limits (for instance, execution of a competitive exercise or of its elements from various initial positions, with different volumes of muscle tension, with the use of the variations of sports techniques, in various combinations, etc.). Many methods of this type can be subdivided proceeding from the condition of variation into two groups: a) actions which are not connected with a change in external conditions, and b) actions connected with the introduction of external conditions, strictly regulating the direction and the limits of variation.

The assignments in variation executed without external regulating influences place higher requirements towards the ability to regulate accurately one's own movements and actions. This may facilitate the perfectioning of specialised feelings, perceptions, notions ("muscle feeling", "speed feeling", "tempo feeling", etc.), instilling coordinating abilities, and, therefore, the reliability of the movement technique formed. Such actions within this group as the variation of the initial positions, separate elements and liaison movements of the competitive combinations (in gymnastics, acrobatics, figure skating, in encounters and games) are important because they allow a lessening of the possibility of derangements in critical situations at competitions.

2. Methods of a loosely regulated variation are connected with several methodological

approaches which differ in concrete essence, methods and conditions of variation.

Here one must have in mind the following:

a) variation connected with the solution of the tactical tasks in conditions of loosely regulated interactions of opponents or partners. This is the so-called free tactical variation (free fights and bouts in single combats, improvement of technical actions in game combinations, arising in the course of the training games, etc.);

b) game variation connected with the use of elements of game and competitive methods in training ("running game", game rivalry in the art of construction of new movements and liaison movements with gymnasts, acrobats, divers, etc.);

c) variation connected with the use in the course of training under unusual conditions of the natural medium and unusual apparatus and sports gear with the aim of special psychological training and enhancing the stability of skills (performance of exercises of a cyclic character on cross-country terrain, in adverse weather, periodical shift of the training sessions from the habitual conditions of a gym to unusual conditions, performing of an exercise on an unusual support surface with various sports apparatus, etc.).

The effect of the factors making for a variation of technique of movements by such an approach is unexpected for an athlete to this or that degree. He has to adapt quickly in the changing conditions and correspondingly restructure the elements of action and change expediently the forms of movement coordination. This ensures the necessary range of variety of the formed skills in a complex with other approaches. Besides, periodic adaptation to the specific conditions of competitions facilitates its increase, especially when their specifics are vividly expressed (mid-mountainous region).

Ways and conditions for increasing "immunity to interference" of the skills. It is not difficult to conclude that most of the methods, ensuring a stability and variety of sports skills, may be regarded as the methods of ensuring the reliability of technique of competitive actions. *The "reliability" of an athlete's actions during competitions is a complex result of perfectioning his skills and abilities, guaranteeing a high effectiveness of actions, despite the arising external and internal interferences, "immunity to interference".* Together with the stability and variety of

skills, reliability is determined by the psychic stability, special endurance, high degree of the development of coordination and of other athlete's abilities. On the whole, the problem of ensuring a reliable result of his action concerns all the main sections of the training session. Here this problem is touched upon in brief, mainly, in the aspect of the athlete's technical training at the stage of perfectioning the formed skills. The main ways and conditions of enhancing their "immunity to interference" (besides those mentioned above) are:

1. Adaptation of skills to the conditions of the ultimate manifestations of physical qualities in training. An athlete's technical preparation in these conditions organically fuses with his special physical training. The volume and the intensity of specific training loads are brought close to the competitive ones and even exceed them (in certain parameters). This is the main adapting factor.

According to the methodology of the "zone-by-zone mastering of intensity", the relation of the number of exercises executed intensively, which does not reach the ultimate or is equal to it, should at the examined stage change towards a gradually increasing share of exercises in the range of 95-100 per cent intensity (in the speed and strength sports). Prerequisite to it is reliable intensity in the previous zone.

The degree of reliability of the formation of skills is sufficiently high if an athlete confidently and without considerable technical violations shows a result calculated for a corresponding intensity zone in at least 70-80 per cent of the total number of attempts. (For instance, the ultimate sports result in the high jumper's current training cycle is 190 cm. The rated range of results corresponding to the upper intensity zone at such a level of achievement is set at 182-190 centimetres. The athlete must work to make at least 7-8 out of 10 attempts of the 182-centimetre and more jumps successful. The prerequisite for it is the achievement of a similar index of "reliability" in the previous intensity zone, which in the given example corresponds to 173-181-centimetre height.)

The reliability of technique in sports requiring ultimate manifestations of endurance depends on the degree of

stability of skills at fatigue. Therefore, the task of instilling skills of the technically perfect execution of competitive action is resolved in unity with the tasks of moulding special endurance. In this connection one of the main methodological directions is the expansion of the volume of exercises executed with ultimate intensity and conjugated with the increase of fatigue in the course of work (in cyclic sports the length of the sections of the competitive distance covered with ultimate speed increases and the number of repetitions rises, while rest intervals between them decrease. In a cyclic sports the number of repetitions of the competitive exercise increases with the motor density of sessions.). Naturally, the degree of fatigue must be so limited as to avoid stable distortions of formed skills (in other words, when testing the skills "for durability" by fatigue, one should not allow considerable deviations from the given optimal movement parameters). In principle, fatigue, if it is not excessive, does not destroy firmly instilled skills but even facilitates the perfectioning of movement coordination.

2. Modelling of psychically tense situations and introducing additional difficulties. As newly formed (or transformed) skills of competitive actions are stabilised, one of the necessary conditions for further enhancing their reliability is the overcoming of the discoordinating interferences which arise in a psychologically tense situations, typical of sporting competitions. The stability of skills in relation to the factors of such a kind is ensured through a most close combination of technical, will and special psychological training. From the very beginning of the stabilisation of skill, it is expedient gradually to exclude methods facilitating the execution of exercises and introduce individual difficulties which make particular tasks of controlling the movements more difficult (complicate spatial and time conditions of actions, limit visual self-control, use extra weights, etc.). As the period of main competitions draws nearer, competitive situations introducing psychic tension must be more fully modelled in training. All this enhances the degree of reliability of the skills formed, if, of course, sufficiently effective methods of the objective control and correction of arising mistakes are used simultaneously, together with the

methods of will and special psychic training, mobilising the athlete for overcoming difficulties.

3. Competitive practice. It is expedient to use a systematic participation in training and official competitions of different rank as a factor of instilling and perfectioning new (renewed) forms of sports technique after the formed skills have been initially stabilised (there's no reason to test their strength in competitions when they are unstable: there will be a tendency for the old skills to be restored). Before the preparatory period ends, competitive practice must make up an important component of the entire system of training. At the stage of a direct preparation for especially important competitions preparatory starts must be subordinated to the task of enhancing the "immunity to interference" of skills and are frequently used in practice by the strongest athletes as often as the training sessions (for instance, up to 6-8 various competitions weekly and sometimes up to two competitions daily).

5. SPORTS TACTICAL PREPARATION

5.1. The Content and the Place of Tactical Preparation in the System of an Athlete's Preparation

Sports tactics as an object of study and perfectioning. Sports tactics in its perfected form is an art of conducting a sporting struggle. Generally, the notion "sports tactics" encompasses all more or less expedient methods of conducting a competition by an athlete (individual tactics) and by a sports team (team tactics) subordinated to a definite idea and plan of achieving a competitive aim. The essence of the athlete's tactics is the use of such methods of conducting a competition which would allow to realise with maximum effectiveness one's own abilities (physical, psychological, technical) and to overcome the opponent's resistance with the least expense.

The initial factor in sports tactics is the general tactical idea—the principle of conducting a competition worked out, as a rule, before the competition as a main line of organising one's actions, interactions (in team competitions) and in overcoming the opponent's counteractions on the road of achieving the competitive goal. The

general tactical idea, for instance, with the long-distance runner may be in the desire to ensure an equal distribution of strength over the distance, most favourable for achieving a record result, or in using spurts and other methods of struggle in the distance, which, although may not guarantee a record result, can facilitate to win the victory over opponents since they place them in a difficult position. The tactical idea in sports games very often ensues from the desire to foist upon the opposing team the game in a manner unfavourable for it and so on. The idea is concretised in a tactical plan, which may be a number of successive tasks and methods of their solution. The tactical idea and plan are an initial model of the athlete's (team's) tactics in the forthcoming competition. It is on them that the expediency of sports tactics in the first place depends if they are evolved with due account of the real possibilities of the athlete or the team.

The tactical idea or plan, no matter how meticulously they may be evolved, invariably are corrected in the course of a competition as applied to actually developing competitive situations. Therefore, practical elements of sports tactics must be regarded not only as the means of realising the tactical line planned beforehand, but also as methods of resolving tactical tasks, which arise directly during the competition.

In most cases the practical elements of the sports tactics are:

first, the expedient methods of combining and transforming (varying) competitive actions, conditioned by the logic of the competition (for instance, combining and varying defence, counter-attacking and attacking actions in encounters and sports games depending on the actions of an opponent);

second, methods of the rational distribution of strength in the competitive exercises and when they are reproduced in the competition;

third, methods of the psychological influencing on the opponent and camouflaging of intentions (for instance, demonstration of confidence and of general preparedness for a competition before its start, during a warming-up period, or, on the contrary, camouflaging one's own intentions right up to the decisive moment, imitation and mimical methods during an encounter, which create in an opponent a delusive picture about the planned actions).

Specifics of tactics in various sports are conditioned, first of all, by the specifics of contacts among the participants in the competition and by the specifics of the ratio of factors determining sports achievements.

Sports games and encounters are characterised by the most complicated and diverse tactics. It is not accidental that they are called tactical sports, emphasising the fact that the outcome of the competitions very often in decisive measure depends on an athlete's tactical skill. Direct contact of opponents, expressed in a direct physical actions against each other (boxing, wrestling, ice hockey, rugby, etc.) or in indirect actions with the help of sports weapons or some other object (fencing, ball games, etc.) is a specific feature of tactics in these sports. Such a character of competitive contacts obliges athletes to react to the actions of opponents instantaneously and anticipate them. This demands a well-developed operative tactical thought, in particular, the ability to model in one's mind the intentions of an opponent during the encounter before they are realised in action. In team games the tactics is made more complicated by group interactions and counteractions. The tactics and technique of sports games and encounters are organically combined in the form of technical and tactical actions, which are the basic elements of the content of both technical and tactical preparation.

The tactics in other sports, the laws of competitions which exclude direct actions or actions with the help of sports weapons or some other objects (most sports belong here), are quite different in character. The possibilities of the tactical mutual interaction of competitors in such sports are limited, mainly, by the sphere of psychic influences. The main practical forms of tactics here are in the rational distribution of strength during the competition (preliminary starts and finals in cyclic sports, competitions according to a compulsory or free programme in gymnastics or similar sports, etc.), in demonstrating qualitative and quantitative indices of results necessary for a successful outcome of the competitions and in influencing the opponent's performance. Tactical specifics in certain sports ensue, in parti-

cular, from the conditions of synchronuousness or asynchronuousness of the opponents' performance, as well as from the structural specifics and intensity of competitive exercises. Thus, in sports demanding ultimate manifestation of endurance, when competitors run in the same race (heat, etc.), the choice for a given athlete of the variant of distribution of forces over the distance and the struggle for its realisation with opponents trying to impose their own tactics, are the main tactical problem. When the rivals compete not simultaneously (in ski races, for instance), the task of showing the result which would not be beaten by the athlete after you, is added to the task of the optimal distribution of forces. In gymnastics or in similar sports the tactics may be expressed, besides everything else, in a partial change of the free programme of competition, when an athlete is forced to resort to it because of competition with an athlete performing earlier.

The basis of sporting and tactical skill no matter in what way it identifies itself, includes *tactical knowledge, skills and qualities as well as the qualities of tactical thought.*

An athlete's tactical knowledge is in fact the scientific and practical data about the principles and rational forms of tactics evolved in the chosen sport (and in sport in general) the tendencies of their development, rules of use and conditions in which they turn out to be most effective, as well as the generalised information about real and potential sports opponents (about their strong and weak qualities, favourite tactics, specifics of preparation, etc.). The expediency, fundamentality and flexibility of the athlete's tactical ideas and plans largely depend on the scope and depth of such knowledge.

Tactical knowledge finds practical use in the shape of tactical skills and habits, which are being formed as a result of teaching intellectual operations and motor actions making up the basis of sports tactics. This, in particular, includes the skills of working out technical ideas, plans, processing information, evaluation of competitive situations and adopting decisions, as well as motor knowledge and skills, necessary for the successful solution of tactical tasks during competitions. The athletes' tactical skill is based both on knowledge and on skills, but the methods of conducting competition on the whole, obviously, never

turns into a skill (stable automated form of behavior). In other words, tactical skills are formed as applied to certain operations (methods) and their combinations. But on the whole they are united not by a type of rigid stereotyped links, but rather by the type of flexible variable combinations characteristic for complicated motor skills.

Tactical thought is developed in unity with the formation of tactical knowledge and skills and habits. The basic qualities are expressed in the ability of an athlete quickly to grasp, appraise, single out and process information, essential for the solution of tactical tasks in a competition, to foresee the opponent's actions and the outcome of competitive situations, and what is the main thing, to find by the shortest route a solution among several possible variants which would lead to success with maximum possibility. There's no doubt that these qualities are essential in any sport, although their contribution to sporting achievement obviously is not the same in different sports. As it has already been emphasised, the role of operative tactical thought in sports games and encounters, where very often it is the decisive factor in scoring victory, is especially great, and not only "other conditions being equal". Facts show, for instance, that the fencer possessing a highly-developed ability to foresee the opponent's actions, turns out to be the winner even in those cases when he yields to his rivals in the development of elementary psychomotor abilities—quickness of motor reaction, etc.

The determining traits of the socialist sports school and the athlete's ethical principles find their identification in sports tactics. The highest qualitative criterion in the Soviet sports school is when tactics correspond to general moral principles. Collectivity, high activity and a creative character are typical tactical traits of Soviet athletes along with the humaneness of ideas and methods of conducting competition.

The tasks and links of the tactical training with other aspects of the athlete's training. After teaching an athlete the ABC of sports tactics, the following tasks of achieving and perfectioning tactical skill must be resolved:

—constant replenishment and deepening of knowledge about the regularities of sports tactics, effective forms and tendencies of its development in the selected and related sports;

—a systematic "reconnaissance" (gathering information about rivals, conditions of forthcoming competitions, including specifics of the regime of competitions and the social and psychological atmosphere), the evolvement of tactical ideas and plans as applied to this data;

—the renewal and thorough perfectioning of sporting tactical knowledge and skills in unity with the realisation of tasks of the physical, technical and special psychological training for decisive competitions;

—the instilling of tactical thought and abilities directly connected with it upon which the growth of tactical skill depends.

Thus, immediate, long-term, general educational, and special educational tasks are combined in the process of the athlete's tactical training preparation. Their solution makes up one of the main aspects of the intellectual development of an athlete (I.1.). It is also part of the practical content of sports training. Competitions are the highest form of sporting and tactical preparation.

The tactical preparation as a practical section of the training content is most fully represented at the stages directly preceding major competitions and at "intermediary" stages (between major competitions, if there are a few of them in the given training cycle). At the beginning of the preparatory period this section includes the formation of new and the perfectioning of tactical actions formed earlier, as elements of the integral forms of the selected competitive tactics. Thus, the logics of their construction is characterised by the transition from individual elements to a whole, which is being realised depending on the level of the general and special preparedness reached.

In relation to other sections of the training content tactical preparation is a kind of uniting factor, since at the final stage of the preparatory period of each big training cycle the general effect of all the sections of preparation should merge, speaking figuratively, into a single—the form of the expedient tactics of performance in major competitions. On the other hand, the realisation of the tasks of an athlete's tactical training depends to this or that degree on the content of all other sections of his training.

3.2. The Ways of Tactical Preparation in the Training Process

On the ways of the optimisation of the prerequisites of the tactical perfectioning. The formation and perfectioning of the sporting and tactical skill is greatly preconditioned by the athlete's technical preparedness, by instilling coordinating abilities, the abilities to orientate in space and time (the "feeling of time" and the "feeling of space"), by instilling special competitive endurance and special psychological preparation for competition. Some important practical prerequisites of the athlete's tactical perfectioning are ensured through an organic combining of the athlete's tactical perfectioning with these aspects of the training content. It is clear that no matter how artful tactical ideas are the tactics chosen by the athlete will be practically useless if they are not shored up by the technical, physical and psychological preparedness, objectively necessary for realising these intentions.

In the formation and perfectioning of the skills of competitive actions, tactical preparation, as it has already been shown, is especially closely linked with the technical preparation. The forming of technique of the competitive actions precedes the forming of tactical skills, i. e., is a necessary step on the road of the formation of the practical forms of sports tactics. In many sports the tactical flexibility and effectiveness decisively depends on the diversity and degree of perfectioning of the sporting and technical skills. The aspects between technical and tactical training in the course of preparatory training apparently disappear, especially at the final stage, when ensuring the tactical variety and the reliability of technique of the competitive action as applied to the conditions of the competitions becomes the main task.

The transfer of tactical knowledge and skills, acquired as a result of engaging in related sports, may facilitate tactical perfectioning in the sport chosen. Herein lies the applied essence of the athlete's general tactical perfectioning (ice hockey players, for instance, use tactical elements of other sports games, wrestlers—elements of other kinds of wrestling). Together with it general tactical perfectioning facilitates the instilling of a broad tactical thought, coordinating and other abilities.

"Tactical exercises" used in training. The tactical forms of executing special and preparatory, as well as competitive exercises—so-called "tactical exercises"—serve as specific means and methods of tactical perfectioning. The following aspects distinguish them from other training exercises:

—the assignment in executing the given exercises is orientated, first of all, at the solution of tactical tasks;

—individual tactical methods or integral forms of the competitive tactics are modelled practically (reproduced more or less approximately);

—the external conditions of competitions are modelled if necessary.

A number of propositions, discussed when analysing the methodological foundations of the athlete's technical training are spread to the methods of tactical training exercises used during training. This concerns general methodological rules of the formation of an approximate basis of actions included in the content of the tactical methods, their learning and perfectioning. Depending on the training stages, tactical exercises are used in lightened and complicated conditions, and in the conditions maximally approaching competitive ones.

Tactical exercises in lightened conditions. Usually the conditions of performing tactical exercises during training (relative to the conditions of a competition) have to be lightened when forming new complicated skills and habits or when transforming those formed earlier. More often than not it is attained through simplifying tactical forms being studied, dismembering them into less complicated operations (separating, for instance, the actions of attacking or defensive tactics in sports games and encounters, start tactics, positional struggle at the running distance, intermediary and finishing spurts in cyclic sports). Initially external conditions are lightened in combination with the given approach or without it so as to facilitate a more accurate execution of tactical assignments.

Thus, when studying tactical actions in sports games and encounters, counteractions are the first to be simplified: the variety of the attacking or defensive actions of the conditional rival are limited, thus narrowing down the range of the possible interferences; the initial positions, the borders of movements and other manoeuvres are regulated

so as to create favourable conditions for one of the opposing sides. In cyclic sports, when mastering tactical methods of distributing forces over a distance, lightened conditions are created with the help of pacing, correcting information in the course of an exercise and by other ways.

It is quite understandable that lightened tactical exercises, just as all other exercises of this type, play in training a purely auxiliary role: they are necessary only as intermediary stages on the road to mastering the planned tactics of competitions. As soon as an athlete or a team performs the tactical task in lightened conditions without obvious difficulty, there is no sense to delay in passing over to more complicated forms of tactical exercises.

Tactical exercises in complicated conditions. The aim of the use of tactical exercises of a heightened difficulty is to ensure reliability of the forms of tactics already mastered and to stimulate the development of tactical abilities. Among the relatively general methodological approaches, involved in these exercises, are:

a) approaches connected with the introduction of additional tactical counteractions on the part of an opponent. An athlete or a team is faced with the necessity, while solving the task, to overcome considerably greater counteractions, than in the conditions allowed by the rules of the competitions. Naturally, additional counteractions, while demanding from an athlete ultimate mobilisation of his tactical abilities, should not exceed his real abilities;

b) approaches connected with limiting of the action's space and time conditions. The methodological essence of such limitations lies in perfectioning the ability to resolve tactical tasks when space and time are rigidly limited as, for instance, in tactical manoeuvring in sports games or encounters in an extremely limited space when performing tactical operations of an attacking nature in a strictly limited time. A somewhat different but in principle similar approach is used in reducing the time allotted for "tuning up" for executing test attempts in a training trial (in jumping, throwing, weightlifting, gymnastics, etc.);

c) approaches connected with heightened requirements of the varieties of the tactics. As distinct from previous approaches, the accent is made here on making more com-

plicated not so much the external conditions of the realisation of the tactical tasks, as on the tasks themselves: an athlete or a team is assigned to vary tactics in the process of an exercise (training games, bouts, sparrings, covering a distance, etc.), changing it according to a planned programme or at a sudden (stipulated beforehand) signal. Such approaches, if they are sufficiently developed methodologically, help lend the athlete's tactics necessary flexibility, diversity and variety unexpected for an opponent;

d) approaches connected with limiting the number of attempts granted for achieving the competitive goal and usage of heightened criteria of victories.

These and such like methodological approaches, while requiring heightened requirements towards an athlete's self-mobilisation, reliability and the effectiveness of competitive actions, play an important role in the tactical and technical perfectioning;

e) approaches connected with the "deoptimisation" of an athlete's operative state with the aim of increasing the requirements towards the athlete's reliability of technical and tactical knowledge and skills. What is meant here are the approaches mentioned above which in this case are used against the background of fatigue and in situations giving rise to psychological tension (the change in the process of the test attempt unexpected for an athlete, reducing to a minimum the time granted for rest between the attempts and for qualifying attempts when doing competitive exercises, an unexpected replacement of an opponent for a stronger one, introduction into the situation sound and other interferences, for instance, sound and light signals, etc.). Tactical training in these cases is directly linked with a special psychological preparation and moulding of a competitive endurance.

Tactical exercises in conditions, maximally approaching the conditions of the forthcoming competition. At the stage of a direct preparation for an important competition the methodology of the tactical training must ensure, first and foremost, a possibly full modelling of the integral tactical forms, which will be used in this competition.

The aim of modelling is to approve the worked-out tactical intentions and plan in conditions which maximally coincide with the conditions of the forthcoming competition, including concrete composition of the participants, competition schedule, method of naming the winner, climatic and geographical conditions.

It is impossible for understandable reasons to recreate the tactics and the conditions of forthcoming competitions in all details, especially in sports games and encounters, but one can and must model the main traits of the realisation of the tactical plan and main conditions influencing its realisation. The main problem of modelling in sports distinguished by direct contacts between the opponents in the course of competitions is the selection of a partner (or partners) with the same peculiarities of technique, tactics, physical and psychological qualities than their main opponents have in the forthcoming competition.

Tactically orientated competitive practice. The main road of acquiring competitive experience, making up a practical foundation of an athlete's tactical mastery is the road of systematic participation in competitions of various character. The direct use of competitions for tactical training presumes a special organisation of competitive practice, in particular:

—forming tactical assignments in accordance with the individual (team) plan of the preparation for competitions of different rank, envisaged by the official sports calendar;

—organising additional meets (friendly, match, tournament, etc.) corresponding in time, composition of the participants and degree of responsibility to the general logic of the preparation for the main competitions;

—holding training competitions with a tactical aim, which together with the official and semi-official competitions should constitute an interrelated links of the competitive practice, sufficient in volume and quality.

Only when each performance is an object of thorough analysis with an impartial evaluation of all the tactical mistakes and concrete conclusions for the current tasks of tactical preparation can competitive practice become a school for the athlete's tactical mastery.

Chapter Six

Instilling Coordinating and Some Other Abilities Linked with Them

1. THE FUNDAMENTALS OF INSTILLING COORDINATING ABILITIES

1. 1. Initial Remarks and Tasks

The notion "coordinating abilities" in the given context is singled out from the general and less definite notion "agility" widely used in everyday life and in literature on physical education. Under coordinating abilities we must understand, first, the ability expediently to form, coordinate and link into an integral whole the motive actions, second, the ability to transform actions already worked out, or to change from some over to other depending on requirements of changing situation. These abilities to a considerable degree coincide, but have their own specifics. It isn't difficult to imagine, say a gymnast, who successfully masters a new complex combination of movements, but finds it difficult to demonstrate them skilfully as soon as the conditions of their execution change.

The coordinating functions of the central nervous system and of one of its properties, which Ivan Pavlov called plasticity, are given a leading role in the physiological treatment of the essence of coordinating abilities. The ability qualitatively to coordinate movements, undoubtedly, depends on the perfection of functions of the analysers. This fact has partially been proved by experiment. The experience acquired of the assimilation and restructuring of movements is of determining significance: in principle the richer the store of motor knowledge and skills mastered by the athlete, the greater the opportunities for mastering new movements and restructuring them in case of necessity.

Various criteria are used to evaluate coordinating abilities, with none of them being generally excepted so far. The degree of the development of these abilities allow in some measure to judge the time expended on mastering new forms of motor movements or on the restructuring of those already mastered, the indices of the accuracy of movements reached (in time, space and in the degree of effort), as well as the general criteria used for evaluating the degree of perfectioning sports technique.

The general tasks of instilling an athlete's coordination abilities are found in the optimisation of the process of their development as applied to the requirements of the selected sport. Partial and to a certain degree coinciding tasks are: systematic renewal of the "motor" experience of an athlete (fund of the motor knowledge and skills mastered by him), perfectioning of the functions of movement analysers and the ability of expediently to regulate muscle tension in definite spatial and time conditions. These tasks are resolved in the process of general and special physical, technical and tactical training. The complex of this ensures a diversified development of coordinating abilities. The degree of their development depends on the specifics of the sport selected.

The ability to form new, ever more complicated forms of movements is increasingly required in sports which have periodically renewed compulsory and free programmes of competitions (gymnastics and rhythmic gymnastics, acrobatics, figure skating, diving). Progress in other sports with a complicated composition of motor actions considerably depends on this ability. The ability quickly and expediently to transform the movements and forms of movements in the course of competitions belongs to leading factors of achievements above all in sports games and encounters, as well as in such sports as downhill skiing, mountain and water slalom, in which obstacles are intentionally introduced into the actions so that skiers have instantaneously to change their movements or shift from one precisely coordinated movement to another.

In the mentioned sports the coordinating abilities answering sports specialisation are honed to the maximum degree of perfection. A definite level of their development has to be envisaged in all other sports.

Seemingly, such tasks have no essential significance in sports with standard structures of movements and relatively constant permanent competitive conditions. However, the purposeful development of coordinating abilities in the given case is one of the determining aspects of sports perfectioning, on which above all depends the level of the sports technical and tactical mastery. If account is not taken of all this, constant specialisation in standard forms of movements will lead to stagnant motor skills and will

narrow down the very possibility of their restructuring and renewal. As a result a stable stereotype movement can develop—a coordinating barrier of a kind which it is especially difficult to overcome when it coincides with a speed barrier. The more standard is the structure of movements and the narrower the object of specialisation, the more significant is the fight against excessive stereotypisation of the forms of motor activity through purposeful actions on the development of coordinating abilities in the process of sports perfectioning.

1. 2. Means and Distinctive Traits of Methodics

In principle, most various exercises from among the number of means of the general and special training can be used as a way of instilling coordinating abilities if they are not connected with the overcoming of coordinating difficulties. As an exercise becomes habitual, the form of movement coordination typical for it becomes instilled more and more and it is no longer effective on the coordinating abilities. To maintain the effectiveness of training in this respect, the exercise must be changed or replaced by a new one. A novelty, unusualness and a degree of coordinating difficulties thus demanded *are the determining criteria of the choice of motive assignments for instilling coordinating abilities.* The composition of means (aggregate of exercises) used for this purpose, must be distinguished for their dynamics, i. e., it must constantly be renewed in the course of sports perfectioning. In mastering a new exercise, an athlete not only qualitatively replenishes his motor experience, but "trains his training level", as an ability to learn ever new forms of coordinating movements. *This is a leading direction in instilling coordinating abilities, especially at the first stages of perfectioning in sport.*

Since the degree of the possible renewal of the forms of movement coordination in the chosen sport depends on the diversity of technique and tactics inherent in it, the richer their motor composition the greater is the role of the means of sports specialisation (competitive and special and preparatory exercises) in instilling an athlete's coordinating

abilities. If the selected sport is distinguished by relatively narrow and standard composition of movements (running, throwing, etc.), the complex of sports and auxiliary gymnastic (including acrobatic) exercises, mobile games and sports, related to the selected one are often the main means of replenishing the fund of the motor skills and habits. Effective in this respect may be not only the exercises related to the selected sport, but also those which have an essentially different coordinating structure; the latter playing at times a specially important role in instilling coordinating abilities. The skills in this case are mastered not because of themselves but following the effect of development which is created in the process of establishing new forms of movement coordination and their interaction with those mastered earlier: training in mastering them, an athlete thus trains his coordinating abilities and enhances his general training level.

This circumstance has not as yet been given due attention in sports practice. This is often expressed in the desire to conduct training on the basis of a narrow range of habitual exercises. As a result, regardless of our desire, the constantly instilled stereotype skills turn into an insurmountable "coordinating barrier", which restricts the perspectives of perfectioning in sport.

On the other hand, the inexpediency of excessive expansion of the composition of training despite the regularities of the sports specialisation is also obvious. Definite proportions in the use of habitual and new training means have to be observed at every stage. It is known that with each next stage time expenditures on the perfectioning of the selected exercises increase and it becomes more difficult to find time for mastering additional exercises. That is why introduction of the factor of unusualness in executing habitual actions becomes the leading line of the methodics as sports specialisation deepens, so as to ensure increasing demands on coordinating movements.

The methodological features of this line boils down in most cases to three approaches: first, strictly-assigned change of certain characteristics, or of the entire form of habitual motor action, complicating movement coordina-

tion; second, execution of habitual actions in unusual combinations; third, introduction of various external conditions, forcing a variation of the habitual forms of movement coordination.

The specifics of rating loads and rest when executing "coordination assignments" are determined first of all by the fact that they demand utmost concentration of attention, subtle differentiations and regulations, considerable will alertness. The creation of new forms of movement coordination and, what is more, restructuring of the firmly-formed coordination links present a rather difficult task for the nervous system. Naturally, it is best of all to tackle it at the beginning of the main part of the training session when the athlete retains optimal psychological and general work capacity. The total volume of load (the total number of exercises and repetitions) in such assignments is usually relatively small (at times only one or two exercises with several repetitions in each). Practically, it is limited not only by the level of coordination difficulties but also by the sum energy expenditure which these exercises entail.

Table 8

Examples of Methods Ensuring the Increase of Requirements to Coordination of Movements When Executing Habitual Actions

Basis of methodological action	Examples
Introduction of unusual initial positions	Long jumps standing with one's back towards the direction of the jump
"Mirror" execution of of exercises	Throwing discus with the left hand; boxing in the right-hand guard; executing combinations of gymnastic exercises in the "mirror" variant
Change of speed or tempo of movements	Jumping with an accelerated run-up, executing gymnastic combinations in an unaccustomed tempo (speeded up or slowed down)

Continued

Complication of movement coordination with the help of assignments of the juggling type	Juggling in special-preparatory exercises with the ball, gymnastic maces, shot, etc.
Changing the method of executing actions, competing in "motor creativeness"	Long and high jumps with the use of different variants of jumping technique. Executing exercises on gymnastic apparatus with a free (possibly unusual) method while conditionally competing with partners
Complication of actions by introducing additional movements and combining actions in unaccustomed conditions	Vaulting with additional turns before landing or with some other additional movements; discus and hammer throwing with an increased number of turns. Introducing a newly learned method of the game or encounter into various technical and tactical actions. Combining well-mastered gymnastic elements into a new combination, executed without preparation
Variation of tactical conditions	Executing assignments envisaging the use of different variants of tactical interactions or counteractions; participating in competitions with different opponents and partners
Introduction of additional objects of actions and signal irritants, requiring prompt change of actions	Game exercises with an increased number of balls, pucks, etc. Executing game assignments with preconditioned reaction on sudden signals
Change of spatial borders within which an exercise is being performed	Discus or hammer throwing from a smaller circle; game exercises on a smaller court or pitch (in football, handball, volleyball, etc.); sparring on a smaller ring; packing obstacles on a slalom run route; executing balancing exercises on a smaller rest support
Directed variation of external weights	Changing loads according to a definite programme envisaging a precise differentiation of the volume of the efforts applied
Use of various material, technical and natural media conditions of the session for expanding the range of the variation of motor skills	Periodic execution of exercises with the use of sports apparatus of various quality. Alternating sessions in the open and at different sports facilities. Conducting sessions in various natural conditions (landscape, weather etc.)

The duration of rest intervals between repeated attempts to perform a coordinatingly difficult motor assignment greatly depends on the degree of stabilisation of motor skills, strength, speed and other characteristics of the exercise performed and on the general load volume. Therefore, the duration of an interval may vary considerably in different conditions. Generally, the following rule is justified: the rest period between repeated attempts must not be shorter than is necessary to prevent coordination violations caused by fatigue. If in the course of repetitions a tendency towards such disturbances begins to show, the coach must either increase rest intervals or switch over to exercises which do not demand new complicated coordination tasks.

This, however, does not mean that movement coordination must not be perfectioned at all against the background of fatigue. There are serious arguments supporting the fact that fatigue, too, in certain conditions, may have a positive effect on movement coordination. When fatigue sets in the process of long muscle effort a necessity arises to spare energy by doing away with non-effective expenditures. This economy can, in principle, be reached without lowering the athlete's efficiency (with long-distance runners, for instance, energy expenditure, as fatigue sets in over the distance, may diminish, according to research data, up to 5-6 per cent without actually affecting the speed of running). This is possible, in particular, if the athlete eliminates superfluous movements, tensions and other coordination imperfections. Thus, fatigue appears to force the need to look for better forms of movement coordination and for coordination of the functions of the motor apparatus and vegetative systems (of course, we do not have in mind here an extreme degree of fatigue leading to discoordination). Fatigue stops being an assisting factor when new motor skills are just being formed, especially if they are complicated in coordination respect.

2. WAYS OF PERFECTIONING SOME FUNCTIONAL PROPERTIES AND COMPLEX ABILITIES INFLUENCING MOVEMENT CONTROL

2. 1. Ways of Overcoming Irrational Muscle Tension (Constraint)

The problem of fighting excessive muscle tension partially coincides with the tasks of perfectioning movement coordination. Together with the so-called "coordination tension", which is expressed in insufficiently full loosening of muscles after contraction, or in their slow transfer to the loosening phase, there can also be excessive muscle tone which is preserved in the non-working state (hypermiotonia). It is known that these forms of tension have a negative effect on the general results of sports motor actions, since they obstruct the establishment of perfected movement technique and their execution with the necessary strength and speed (due to the retarding tension of the muscles-antagonists) causing excessive energy expenditure, facilitating early fatigue.

The instilling of the ability to regulate optimally the muscle tone and combine the ultimate tension state with a deep loosening is a prolonged process representing one of the aspects of the athlete's training over many years and is especially closely connected with the instilling of coordination abilities and sports and technical perfectioning.

It is rightly stressed in the special methodological literature that to free oneself from muscle "constraint" an athlete must, first and foremost, s e t h i s s i g h t s o n a r a t i o n a l l o o s e n i n g u p. With this aim in view, as well as the usual methods of explanation and prompting, it is recommended to use the methods of ideo-motor exercises, "autogenic training" and create external conditions, which constantly remind about the necessity persistently to master "the art of loosening up". Correspondingly directed physical exercises—"loosening up exercises"—are used as the main practical means of fighting muscle tension.

The degree of arbitrary loosening up of an athlete's muscles changes considerably as a result of systematic exercises. Thus, the amplitude of the muscle's hardness in a tensed and loosened up state (it is registered with the help of a tonometric apparatus as an indirect index of the ability toward loosening up) may be greatly increased in the process of annual specially-directed training. The time of passing of the muscles from the phase of contraction to the loosening phase also changes considerably. With the increase of sporting mastery the indices of the latent contraction and loosening time as a general tendency draw closer until the loosening time becomes less than the contraction time.

The coordination tension is usually expressed more at the

initial stage of the formation of motor skills. The natural initial constraint of movements is overcome in the process of the rational teaching the sooner the higher the degree of the development of coordinating abilities.

Coordinating tension arises when executing habitual motive actions. This is usually conditioned by fatigue, stress situations, which create psychic tension (for instance, by the conditions of important competitions) and by the imperfectioned ability towards arbitrary loosening of one's muscles. Naturally, the ways of overcoming or lowering tension, caused by these reasons, are different. In some cases the instilling of stability against the discoordinating effects of fatigue ("coordination stability" of a kind) may be decisive, in others—enhancing psychic stability against stress situations. But the main way of perfectioning the ability expediently to regulate muscle tension is the systematic execution of correspondingly directed exercises during training.

Table 9

Difference (in sec.) Between the Latent Contraction Time (LCT) and the Latent Loosening Time (LLT) of the Muscles of Athletes of Different Sporting Qualifications

Athlete's qualification	LCT	LLT	Difference LLT-LCT
Novices	0.2980	0.3820	0.0840
3rd rating	0.2708	0.3730	0.1022
2nd rating	0.2500	0.2532	0.0032
1st rating	0.2375	0.2425	0.0050
Master of Sport	0.2304	0.2185	-0.0119

Note: LCT and LLT were determined electromiographically; the time from giving a signal for contraction to the appearance of electric activity in the musle has been taken as LCT and the time from the signal to the loosening up until biocurrents disappear in the muscle—as LLT.

Loosening exercises characterised by a deliberately emphasised change of opposite states of muscles and by combining accented tensions of some muscle groups with an expressed loosening of others.

Complexes of such general preparatory exercises usually envisage a number of assignments, which gradually grow

more and more difficult of the following kind:

—controlled transfer of certain muscle groups from the state of tension over to loosening (instantaneous complete loosening contrasting with tension or through intermediate loosening stages);

—combining loosening of some muscle groups with simultaneous tension of others or loosened-up movements of some links of the locomotive apparatus (for instance, hand) with the fixation or active movements of others;

—execution of integral objectively definite motor actions (lifting a weight, overcoming an obstacle, etc.) with a view of using loosening phases (moments) as fully as possible.

It has been experimentally shown that the greatest loosening effect can be obtained at definite conditions at the cost of instantaneous removal of external resistance at the initial phase of the exercise (simple examples: fast transition over to a loosened "squat" state immediately after the bar is jerked onto the racks; instantaneous "switching off" of the muscles immediately after throwing dumbbells or a stuffed ball, so that the consequent movement is followed by inertia). Such exercises, having forced a loosening gradient, are especially valuable in speed and speed and strength sports.

The above-mentioned exercises are the more effective, obviously, the fuller and more accurately the elements of coordinating movements distinguishing the selected sport are reproduced in them, when using them for eliminating coordinating tension in competitive exercises. However, no matter how rationally preparatory exercises are selected by this indicator, the task of the optimal combination of the maximum effective muscle tensions and loosening in competitive actions must be tackled in the final analysis by competitive exercises. The forming and constant perfectioning of the rhythmic structure of integral competitive exercises in the process of special technical and physical training of an athlete must serve as the basis.

The following methods helping to lessen coordinating tension are practiced when executing competitive exercises:

—initial mental recreation of an image of actions while concentrating the attention on their dynamics and especially on the moments of necessary loosening;

—control of the mimic face muscles (which, as a rule,

reflect general tension perfectly well);

—combining the loosening phases with the forced coming out of them (this facilitates loosening by the mechanism of motor-visceral reflexes);

—use of distracting-liberating assignments of the kind: switching visual control over the process of movements to another situation, watch (for instance, during running) the movements of your partner, exchange remarks with him in the course of an exercise, etc.; use of additional external irritants with similar aims; for instance, of musical accompaniment (in those cases when rhythmical structure of movements does not impede it);

—executing exercises against the background of a certain fatigue provided that it does not result in the discoordination of movements.

Tonic tension, as well as coordinating tension, usually diminishes under the effect of systematic training. But there are individuals even among qualified athletes with a stable inborn hypermiotonia. Temporary tonic tension may arise in everyone as a result of a considerable muscle fatigue.

Fighting against stable tonic tension demands much time and requires a system of frequent loosening exercises encompassing the main muscle groups.

In this case preference is given to exercises of the type of free swinging and rhythmical recurrent loosening of adjacent muscular groups (shaking, etc.). Usually these exercises are combined with those on expansion and are included in the intervals between the loads of the strength and speed type. This promotes the perfectioning of loosening ability and also creates favourable conditions for the rehabilitating processes.

Swimming or simply staying in the water (the water's pushing-out force counters gravitational forces, which cause a reflectory tonus of the muscles taking part in maintaining one's pose in the water) may serve as an effective means of lowering tonic tension. Special warm and water treatment, sauna and massage are also beneficial for removing temporary tonic tension.

2. 2. The Ways of Perfectioning the Stance-Static and Dynamic Stability (the Ability to Retain Balance)

Despite vividly expressed dynamics, characterising most of the sports, the qualitative execution of exercises

always depends on the stability of the stance, in other words, on the ability to maintain balance in this or that body position. The only difference is that in some cases an athlete must maintain the so-called "static balance"—balance in static positions (static elements in gymnastics and acrobatics of the kind of hand stands, one leg stands ("lastochka") position, etc.; initial stands in diving, taking aim in shooting, fixing the bar in weightlifting, etc.), while in other cases static elements are fleeting and change constantly, and the stance more or less changes its form in the course of movements, retaining at the same time general stability—so-called "dynamic balance" (for instance, in running, skating, skiing).

The stance stability, according to a well-known physiological data, is ensured by the stance-tonic reflexes and arbitrary regulation of the stance on the basis of the acquired forms of the coordination of movements with a complex participation of analysers (visual, motor, vestibular, etc.). This is the general mechanism of maintaining balance both in static as well as in dynamic exercises. Its specifics in sports exercises are conditioned by the specifics of interaction of the internal and external forces in maintaining the stance inherent in sports, by the peculiarities of the sensor corrections (due to dissimilar requirements for different organs of feeling when doing different exercises) and the forms of coordinating movements. It is not surprising that balance indices in different exercises infrequently correlate with each other, especially when comparing the indices of the static and dynamic balance stability. Even a small interrelation of these indices cannot be traced in outwardly analogous forms of exercises, for instance, in gymnastics and figure skating.

The ability to keep balance in sports exercises is improved on the basis of mastering sports-technical motor skills and instilling coordination skills. Special tasks in the directed perfectioning of the stance-static and dynamic balance, as applied to the requirements of the selected sport, are tackled on this basis. So-called balance exercises are used for the purpose.

The distinguishing feature of balance exercises is such interaction of the factors influencing stance stability (regulating muscle tensions, body weight and reflexes forces,

torques, etc.), at which it is more difficult to maintain balance. In other words, these are exercises distinguished for a greater complexity of the conditions for maintaining balance. Such exercises in sports training include, above all, the material of the selected sport—elements or integral forms of the competitive action typical for it if they allow the presentation of greater requirements of ability of maintaining balance.

The necessary preconditions to perfectioning stance stability are in acquiring a steady skill of maintaining a rational posture, which would correspond to the biomechanical regularities of the body stability in the given stance and of the skills of optimal balancing in the more complicated conditions of keeping balance. In each case this presupposes the knowledge and a detailed practical mastering of an adequate method of stance balancing or fixing.

For instance, an optimal method of keeping balance in leg stands on the beam is based on the ability to balance with the help of slight movements in the talocrural joints without changing the position of one's body; the stability of a stance when taking aim in pistol shooting is decisively conditioned by the rigid fixation of the legs and trunk; fine regulating movements of the shoulder joints while most of the other body links are rigidly fixed is a most important element of balancing technique in a hand stand.

Achieving a high stance-static stability is ensured by a gradual adoption to the complicated conditions of maintaining stance in static episodes characteristic for the selected sports. In most cases use can be made of various methods of making the conditions more complicated. The choice of a method depends not only on the objective specifics of an exercise, but also on the difficulties experienced in their execution. Thus in some cases mainly psychological difficulties of maintaining balance are increased, for instance, the height of the apparatus, while in others—more complicated biochemical conditions are created: diminishing, for instance, the support base, or introducing natural interferences, as in perfectioning "combat" stances in boxing, wrestling, etc.

Maintaining precisely given stances during and after torque or linear accelerated movements is especially difficult. One of the main ways of perfectioning the ability of keeping balance in such conditions is selectively-directed training of the functions of the vestibular apparatus.

The dynamic stability in cyclic sports is perfected mainly through the adaption of motor skills to various external conditions of movement. The conditions of training are intentionally changed in the process of training (relief, route, ground, cover, sliding, etc.). They are selected so as to facilitate the expansion of the range of variety of the motor skills. Special-preparatory exercises for perfectioning the dynamic stability of the stance in these sports may be made more complicated in principle by all those methods shown in *Table 10*, but, naturally, on another motor basis (for instance, imitation of skiing or skating on a diminished or mobile support, running or riding along a steep curve with periodic switching off of visual control, swimming exercises with rotation).

Table 10

Examples of Methods Used in Perfectioning Stance-Static Balance

The basis of the method of complicating the conditions of maintaining stance	Examples
Prolonging the time of maintaining stance	Two- or three-times exceeding of the time of "holding" in gymnastic exercises in the course of the training session of the set rules of the competitions; increasing the time of immobility of the stance when preparing for shooting
Temporary exclusion of visual self-control (the essence of the method—additional requirements to the motor analyser so as to enhance the role of the "muscle feeling" in maintaining balance)	Execution of well-mastered complicated static exercises on the beam with eyes blind-folded; same thing in a pair or group acrobatic exercises; maintaining stance in wrestling with eyes blindfolded
Diminishing support area	Use of narrowed gymnastic beams (width of the support area—2.5-3 cm); fixing hand stand with a nar-

Continued

	rowed hand support or without one of the support points; fixing bar in the top position with narrowed foot rest
Increasing the height of the support area or distance from the centre of body gravity to the support surface	Increasing the height of the apparatus (beam, parallel or asymmetric bars) on which the exercise is executed; transfer from low support positions (stands on bent hands or legs) over to higher positions (straightening of legs or arms)
Introducing unstable support	Performing assignments connected with the retention of static balance, on a suspended rope, swinging beam, moving platform
Inclusion of preliminary or accompanying movements	Fixing static positions after torque movements (on the floor, on the beam, etc.); juggling with the ball or with the maces in the position of static equilibrium (one leg stand "lastochka", etc.)
Introduction of counteraction	Pair equilibrium exercises in which each of the participants is given a task to maintain the stability of stance despite the counteraction of the partner ("pulling over" and so on)

It would be good to use exercises from related sports as additional means of perfecting static and dynamic stability in the selected sport. The requirements of keeping balance should be higher than those in the selected sport (as for instance, using elements of slalom and downhill in training skiers, certain acrobatic exercises of greater complexity in training gymnasts, divers and figure skaters, track cycling in training road racers, etc.).

2.3. Ways of Perfectioning the "Feeling of Space" and Spatial Movement Precision

All sports representing active motor activity demand a highly-developed ability correctly to judge spatial conditions of the action (distance when interacting with other athletes, distance to the goal, size of the court, or an obstacle, etc.) and precisely measure one's efforts.

The "feeling of space" in most sports is characterised not by passive, but by active perception of spatial relations, directly connected with the regulation of spatial movement parameters on the basis of a complex functioning of the analysers. Therefore, one can speak about an athlete's perfect "feeling of space" only when he can correctly evaluate and accurately observe the spatial condition of the action, regulating his movements accordingly. In the process of sports perfectioning the "feeling of space" is deeply specialised as applied to the specifics of the selected sport. This finds its expression in the "feeling of distance", "feeling of a barrier", "feeling of a plank", as well as in other subtly specialised spatial perceptions and regulations connected with concrete forms of the sports motor skills.

The athlete's spatial notions are specified through perfectioning the precision of movements in the course of the technical, tactical and physical preparation.

Methodological approaches specially directed at perfectioning the "feeling of space" and the spatial accuracy of movements are based on a systematic execution of the assignments with a subsequently increasing requirements to the accuracy of differentiation when evaluating space conditions of the actions and to the accuracy of controlling movements within the limits of the given spatial parameters. The concrete content of the assignments and their methodology in different sports, naturally, depend on the specifics of the subject of sports specialisation.

Perfectioning the "feeling of space" and space accuracy of movements in sports games, encounters and other sports distinguished for their dynamism of competitive situations, is based on the achievement of the general results of technical-tactical actions in variable external conditions. Special methodological approaches are directed at developing the abilities correctly to evaluate the changes of spatial conditions of actions and alter the form of actions or of their components correspondingly. With this aim in view a system of subsequently more and more complicated assignments is

introduced envisaging the directed varying of this or that parameter of the "external space".

For instance, in sports games exercises are practiced connected with the precisely given variation of game distances—distances of passing the ball (puck) or final shots (throws). Usually, the method is to go from the so-called "contrast assignments" demanding relatively rough differentiations (for instance, alternating ball passing in football from 25 and 45, 30 and 50 metres) to "related assignments" requiring more subtle differentiations (in this case within 5 metres and less). In its aggregate this makes up the methodics which is called "approaching assignments". As experiments have shown, in football it allows to develop a high accuracy of spatial perceptions and of proportional dosing of the force of hitting the ball when passing it at a given distance. Similar methods are used in perfectioning the accuracy of shots at the goal, throws at the hoop, etc., but the limits of changing the distance in such cases are rigidly controlled so as not to impair accuracy. Very often when shooting at the goal preference is given to relatively standard distances while varying the size of the goal-mouth and the shooting angle, making assignments more complicated by dividing the goal-mouth into squares or by some other method (with the help of screen-targets of a diminished size, etc.).

In boxing and other encounters a necessity constantly arises of evaluating and calculating the distance to within a centimetre. Judging by the indirect data, an athlete develops an ability to such subtle differentiations extremely slowly. It takes years to acquire such a capacity for differentiating, if it does not become an object of specially directed training. One of the elements of such training is a systematic execution of the assignments when the athlete evaluates various "defensive" and "striking" distances (distant, middle and close range), as well as the accuracy of keeping the given distance in sparring with partners of different height. This allows in a relatively brief span of time an improvement of the "feeling of distance" if the athlete regularly receives prompt objective information in the course of an exercise about the actual parameters of the distance he keeps (special distance metres and other registering devices have been developed for the purpose). Assign-

ments demanding accuracy of shots in direction, time and volume of efforts applied are being executed in parallel.

Perfectioning the "feeling of space" in sports with the relative standard kinematic structure (gymnastics, figure skating, diving, etc.) is based on the achievement of ultimate accuracy of the spatial movement parameters, corresponding to the accepted standards of technical skill. Since external spatial conditions of actions in these sports are mostly standard (the size of the apparatus, courts, facilities, etc.) the evaluation of the given conditions for a qualified athlete is not particularly difficult. Spatial analysis in the course of an exercise in such conditions is orientated at the evaluation not so much of "external space", as on the spatial parameters of one's own movements (their amplitudes, direction), as well as the body position and interrelation of its parts. The ways of perfectioning the "feeling of space" while specialising in a sport of this group merge organically with the ways of perfectioning the spatial movement accuracy.

As is known, requirements towards the spatial accuracy of movement increase as qualification programmes become more and more difficult from one sports rating to another. The accuracy of movement, which is worked for initially in less complicated forms of exercises, is transferred in this or that measure to more complicated forms, if they have considerable structural similarity. But this is only one of the prerequisites of attaining the movement accuracy in new and more complicated forms of exercises. Each time it has to be evolved with the help of the methods calculated for the speediest attainment of standard movement accuracy.

Setting at accuracy, when executing special assignments in sports with a standard kinematic structure more often than not boils down to the following: 1) to make sure that the standard parameters of the amplitude, the direction of movement or body position (assignments for accuracy of reproduction) are repeated accurately and possibly in keeping with the standards; 2) to change certain parameters in a strictly conditioned relation. For instance, one should increase the amplitude by a certain number of degrees in swings on the gymnastic apparatus or

the height of the jump before somersaulting (assignments for the accuracy of change). The first type of assignments is the basic one since technical preparation in the discussed sports is chiefly directed at achieving the stability of the standard movement parameters. Assignments of the second type are mainly differentiating in importance. They are executed in the course of training, when it is possible and expedient according to "related assignments methodics", i. e., with a transition from relatively rough differentiations to more subtle.

A successful execution of the assignments of both types is ensured by a number of methods and conditions. Of importance here is:

–modelling the given stances and movements on special mock-ups (the methodics and simple technical devices for spatial modelling of sports movements have been worked out in most detail in gymnastics);

–directed feeling of movement parameters on the training stands or with a coach's (partner's) physical help;

–introducing into the action of additional objects, graphic and other visual guides, defining border points of the amplitude or direction of movements (for instance, balls suspended at the final points of the swings, bendings and unbendings in exercises on the apparatus, graduated marking);

–informing the athlete in the course of the exercise or immediately after its end about the objective data of the mistakes he made. For this purpose active use is made of modern measuring and information devices enhancing the degree of the accuracy and speed of the information as well as the traditional methods of information based on the coach's visual evaluation.

The direct influencing of the functions of the analysers in the course of training has an important role in perfectioning the "feeling of space" so that higher and more selective requirements are applied to them than when executing competitive exercises. A number of preparatory exercises, methods and special technical means are used for this purpose.

Correspondingly, the selected preparatory exercises with rotations, executed in different conditions, for instance, on

various apparatus (spring board, trampoline, etc.) are used for a directed perfectioning of the functions of the vestibular apparatus in sports which include torque movements, or with the help of special rotary training stands.

The idea of enhancing the functions of analysers at the cost of a temporary exclusion or a limiting of visual self-control is incorporated in certain methodological approaches directed at perfectioning movement accuracy. Making spatial orientation and movement control with the help of the visual analyser more difficult, greater requirements are made on other analysers and "muscle of feeling". The possible deterioration of the quality of movements at the beginning is frequently replaced by an essential increase in their precision under normal conditions. This has been experimentally shown in examples of individual exercises in sports games, gymnastics, athletics, wrestling and other sports. Naturally, visual control may be excluded for all the exercises but only when this does not lead to injuries.

Although spatial, time and dynamic precision of movements in various sports is not always mutually conditioned in similar measure, in real fact any of them can identify itself in no other way as in unity with others. Therefore, preferable attention to making movements precise in any one respect must be combined with the aim of reaching their precision on the whole. This rule must be especially taken into account in sports requiring utmost precision of movements in all respects (for instance, in fencing). The attempt to perfect its separate aspects sometimes gives an opposite effect. Most of the methods discussed envisage simultaneous specification of the spatial as well as other parameters. Some training apparatus is intended for this purpose.

Chapter Seven

An Athlete's Physical Training

Under the heading "physical training of the athlete" we usually understand the instilling in him of physical qualities,

identified in his motor abilities so essential in sport. The specific content of physical training comprises the instilling of strength and speed abilities, endurance and flexibility. On the whole, this aspect of physical training in greater measure than others is characterised by physical loads influencing the morphological properties of man's organism and thus directing his physical development. Physical training in this respect is the basic content of the sports training.

1. INSTILLING STRENGTH ABILITIES (STRENGTH TRAINING)

1.1. Initial Remarks and Tasks

About the notion "strength abilities" and their requirements in sport.

The notion "strength abilities" began to be widely used in the last decades for defining ideas about strength possibilities or about strength being one of the athlete's physical qualities. It has been found in the course of research that various types of strength (for instance, in static conditions, in a prolonged running and in speed and strength exercises) in sport and, generally, in man's motor activity infrequently have little connection or even negatively correlate with each other. This leads to a differentiation of the notion "strength".

Strength abilities proper are revealed most definitely in relatively slow movements with big external weights (for instance, when rising with the bar on the chest from a deep crouch before pushing it up) and in isometric efforts (keeping the bar of maximum weight in a static position, fixing a "cross" in support with arms widespread on the rings, etc.). Strength abilities proper are measured, in particular, by extra load, the time of maximum muscle effort (in static efforts) and mechanical strength displayed (the product of the magnitude of the mass being shifted by acceleration in dynamic exercises). Strength abilities of this type are required in great measure in weightlifting, wrestling and partially in gymnastics (static elements) and such like sports exercises.

When giving a general evaluation of the athlete's strength abilities use is made, as is known, of the criteria of the absolute and relative strength. The first of them characterises maximum strength indices measured by any method (dynamometre, the weight of the bar lifted, etc.), irrespective of the athlete' body weight. *(Table 11)* The second one expresses the relation of the indices of the absolute mass to the athlete's weight. With the increase of the mass of the athlete's body the indices of his absolute strength in principle increase, while those of relative strength decrease. In sports in which the athlete shifts the bar of ultimate weight or trains with other weights, the result especially or to a great degree depends on absolute strength indices. High relative strength indices have a determining importance in sports in which the athlete shifts his body in space without any additional external weights (high and long jumps and such like), as well as in sports in which he has to restrict his own weight within the frameworks of a weight division (in boxing, wrestling, weightlifting, etc., excluding absolute weight divisions).

Speed and strength abilities, as the term itself indicates, are identified in actions, which together with strength demand high speed of movement (track and field jumps and throws, sprinting, boxing, jerks in weightlifting, etc.). Some of such speed and strength manifestations received the name of explosion force. This term is used to indicate the ability to reach a maximum of strength displayed during the movement in a brief time (evaluated, in particular, by a speed and strength index—by the ratio of the maximum value of strength in the given movement and the time of reaching this maximum).

The so-called **reactive properties of muscles** are singled out as the specific factors of the athlete's certain speed and strength abilities. They come to the fore in movements which include instantaneous switching over from yielding to the overcoming regimes of the work of muscles (when pushing off in triple jump after landing with the shock-absorbing bending of the takeoff foot) and are characterised by the fact that the power of the overcoming efforts increases under the effect of the initial rapid "forced" extension of the working muscles due to the kinetic energy of the shifted mass (in the given example—the mass of the athlete's body weight proper in the phase of the shock-absorbing landing). Obviously, the development of these qualities of an athlete's motor apparatus largely defines success in

Table 11

Strength Indices of Different Muscle Groups in Certain Outstanding Athletes

Athletes and their specialisation	muscle groups											
	forearms		shoulder		trunk		hip		crus		foot	
	bend	unbend	bend	unbend	bend	unbend	bend	unbend	bend	unbend	bend	unbend
	Relative strength indices											
V. Brumel (high jump)	*0.98*	*0.86*	0.86	1.16	1.01	3.12	1.03	*3.77*	0.75	*2.74*	0.76	*3.50*
E. Ozolin (sprint)	0.78	0.56	0.66	1.11	0.82	2.75	1.02	3.00	0.64	1.51	0.61	2.73
J. Lusis (javelin)	0.71	0.85	0.64	1.07	0.71	2.91	0.76	3.05	0.51	1.82	0.50	2.83
I. Ter-Ovanesyan (long jump)	0.81	0.46	0.58	1.11	0.70	2.72	0.85	3.40	0.62	2.46	0.62	3.08
P. Bolotnikov (long-distance running)	0.80	0.66	0.80	0.95	0.95	*3.71*	0.95	3.36	0.47	1.46	0.73	3.41
P. Kolchin (skiing)	0.73	0.78	0.69	1.01	0.88	2.86	1.07	2.85	0.61	1.59	0.68	2.88
E. Grishin (skating, sprint)	0.72	0.55	0.59	*1.20*	0.80	2.76	0.78	3.00	0.59	2.32	0.52	3.21
	Maximum relative strength indices											
The biggest of the indices registered in the given and other (of another specialistation) groups of outstanding athletes	0.98	0.86	0.90	1.20	1.11	3.71	1.14	3.77	0.87	2.74	0.89	3.50
	Maximum absolute strength indices											
	81	98	88	110	84	290	93	345	63	320	64	292
	(registered in greater part in Y. Vlasov, weightlifting Olympic champion)											

Notes: 1. Indices are given by the results of measurements on the polydynamometric stand. Absolute strength indices are in kg. and relative—in relative units (as a quotient from division of the absolute strength by the athlete's weight in kg.). 2. Underscored are the indices coinciding with the maximum.

athletic and acrobatic jumping, in jumping elements in gymnastics, figure skating, sports games and so on.

Athlete's strength endurance—is the ability to counter fatigue produced by the strength load components in the selected sport. Ultimate (right up to the expressed drop in the work capacity) time of working with external weights, the weight of which has been preset as applied to the specifics of the selected sport, or the greatest amount of work which the athlete is capable of performing within the given time. Since the level of requirements of strength abilities proper and endurance in various sports differs considerably, the characteristic of strength endurance in each sport has specifics of its own. In some sports requiring ultimate manifestation of strength, strength endurance is determined, first and foremost, by the degree of development of the strength abilities proper. In others, it depends to a greater extent on the specific factors of endurance, with the specific share of the endurance factors the greater, the longer the duration of the competitive exercises and the lesser its power capacity.

A definite correlation of the levels of the given strength abilities—their structure—is made up in the process of sporting specialisation. The data to hand permits it to be said that it is different even in related sports. This has to be taken into account when setting and realising the tasks of the athlete's strength training. No matter in what sport the athlete specialises, his training must include the instilling of the strength abilities proper (strength training proper), speed and strength abilities and strength endurance, although in different correlations.

The tasks and aspects of strength training. The main aims of the athlete's strength training are as follows:

1) to boost strength abilities, being the general precondition of perfectioning in the selected sport and (or) ensure their retention in the necessary measure as applied to the specifics of the training stages and stages of many-year process of perfectioning in a sport;

2) to instil strength abilities, answering the specific requirements of the selected sport, ensuring the development and effective use in such a measure as is necessary for achieving the goal.

The first of these tasks concerns primarily general strength

training, the second–special. They, as all other tasks of sports training, are concretised and subdivided into partial tasks as applied to the specifics of individual sports and the athlete's individual development, training stages and a number of other circumstances.

General strength training plays an important role in ensuring a comprehensive development of muscle groups of the motor apparatus as an integral system. Thus, prerequisites are created for effective manifestation of strength and other of the athlete's qualities in the selected sport. Rational combining it with special strength training allows the formation of an optimal "strength topography"–correlation of strength properties of various muscle groups–which is sufficiently harmonious and at the same time corresponds to the specifics of the sports specialisation. The effect of a "transfer" of strength abilities is widely used in the athlete's strength training: by instilling, for instance, strength proper or speed and strength or strength endurance abilities with the help of general training exercises the coach facilitates the development of corresponding strength abilities in the selected sport. The use of such transfer, its directiveness and degree depend, naturally, on the specifics of the sports specialisation.

Special strength training of an athlete, figuratively speaking, directs the development of strength abilities along the channel of sports specialisation. Thus, it plays a leading role in the formation of the structure of strength abilities as applied to the selected sport.

The tasks of the athlete's special physical training are resolved in direct connection with the realisation of the tasks of the special technical training.

It follows from this that the realisation of the athlete's strength training does not always presuppose maximum development of all his strength abilities. In principle, both in special and in general training the development of strength abilities is ensured in a measure which promotes perfectioning in the selected sport. The development of the strength abilities proper of a long-distance runner, for instance, must be ensured so far as it does not impede highest development of the strength and speed-strength abilities. The same applies to the realisation of any partial task of the athlete's strength training.

Strength exercises are the main means of instilling strength abilities in the training process. With certain exclusions they are characterised by a considerably greater degree of muscle tension than in performing competitive exercises (in sports requiring ultimate manifestation of strength, some strength exercises are characterised by the same degree of tension as during competitions). Additional muscle tension is created in strength exercises more often than not by external extra weights. Various factors, as is known, are used for this purpose–beginning with special sports apparatus and ending with a partner's counter-actions and the conditions of natural media. On methodological plane it is important which factor is used as an external extra weight.

We must distinguish:

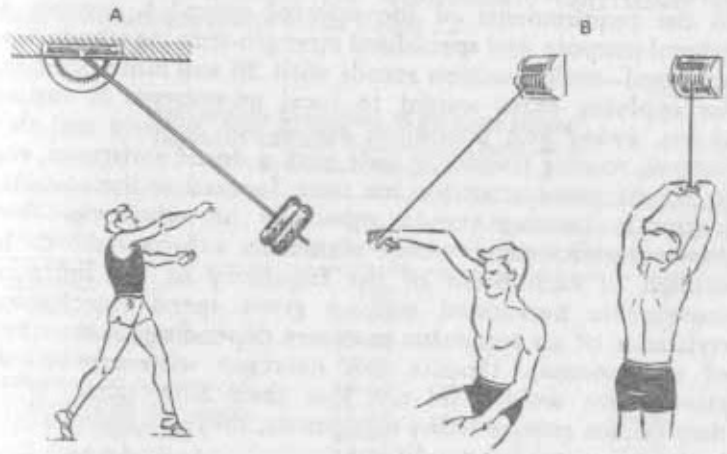

Fig. 9. **Examples of the training devices for strength-building exercises:**
A–pendulum training devices for shot-putters. *B*–isokinetic apparatus used for strength building by the swimmers (the block regulates the magnitude of the resistance depending on the speed of the extension of the cable). Shown here are separate exercises imitating muscle work of the shoulder girdle in crawling and breaststroking.

a) strictly controlled extra weight, which is created by using sports apparatus and equipment enabling precisely to dose the volume and directiveness of the effect of the external forces (bars with a set of discus of various weight, training stands with block, spring, swing and other devices for controlling the resistance to movements, etc.);

b) approximately controlled (during an exercise) extra weight which is not strictly regulated and is being created with the help of natural media (as for instance, running uphill, along the loose snow, in the water, etc.) as well as using objects and appliances on hand, without precise regulators of loads (hand expanders, rubber shock-absorbers, extra-heavy shoes, etc.).

Extra weight means in the methodics of strength exercises are perfectioned at present by introducing technical devices which allow to set extra weights precisely, to directionally influence the main muscle groups and to set strictly defined regimes of their functioning, corresponding to the requirements of the selected sport. A number of general-purpose and specialised strength-training stands have appeared—multi-position stands with 20 and more positions for applying extra weight to local movements in various sports, swing and pendulum stands for jumpers and shot putters, rowing training stands with a dosed resistance, etc. In recent years attention has been focused at the so-called isokinetic training stands, especially in swimming. They create conditions at which maximum efforts have to be applied at each point of the trajectory of the imitating movements performed with a given speed (mechanical resistance of an apparatus increases depending on the speed of movements). Despite this exercises with non-strictly rated extra weight did not lose their importance. When they do not require bulky equipment, they can conveniently be used in everyday conditions.

Wide use is made in strength training of an athlete of exercises with one's own weight in which the athlete's own body weight serves as the main factor of the counteraction, inertia and other mechanical forces arising when his mass is shifted (chins-up on the horizontal bar, push-ups and such like gymnastic exercises on the apparatus and without them, jumps with intensive push-offs, etc.) The volume of such extra weights is relatively standard. This decreases their worthiness as the means of strength training proper, but they are needed for resolving certain tasks of sports specialisation.

Sometimes exercises of self-resistance, once widely known under the name of will gymnastics, are used as one of the additional means of instilling strength abilities. The effect of the manifestation of strength in the given case is achieved by a simultaneous tensing of muscles (as in imitating pressing up of the bar while overcoming the resistance of the arm flexor muscles). Such exercises may in certain measure facilitate the development of strength properties of the muscle apparatus. However, their usefulness in training of highly qualified athletes is doubtful and, in any case, cannot be great.

The volume of the external influence in strength exercises with rated extra weights are usually evaluated in percentage (from an individual maximum load) or in an ultimate number of repetitions in one "approach" (a series of continuous repetitions). An approximate correlation of these magnitudes is shown in *Table 12*.

Table 12

Approximate Correlation of the Extra Weight and of the Ultimate Number of Repetitions in Strength Exercises

Conditional evaluation of the intensity	Extra weight (in per cent to the maximum)	Number of possible repetitions in a single approach
Maximum	100	1
Sub-maximum	99-90	2-3
Big (1st sub-zone)	89-80	4-6
Big (2nd sub-zone)	79-70	7-10
Moderate (1st sub-zone)	69-60	11-15
Moderate (2nd sub-zone)	59-50	16-20
Small (1st sub-zone)	49-40	21-50
Small (2nd sub-zone)	39-30	51 and more

According to the general classification of the training means, all the strength exercises are subdivided into general preparatory, special-preparatory and training forms of competitive exercises.

General preparatory strength exercises are selected, mainly, from a number of means of

auxiliary gymnastics and weightlifting. These can be exercises connected with general strength loads (crouching with considerable weights, exercises in pairs of the wrestling type, etc.) and with a relatively local effect on separate muscle groups (exercises with resistance for flexors and extensors of the forearm, neck, trunk and legs, conductor and abductor muscles, etc.).

The degree of the structural likeness with the competitive actions in selecting exercises of the given group, although taken into account, has no determining importance. A number of general preparatory strength exercises are used in connection with the necessity to level out any lop-sided specialisation and, therefore, has a non-unidirected character.

Special-preparatory strength exercises are elements of competitive actions or movements formed on their basis which are lent the character of directed strength loads. Typical for this group of exercises is the fact that together with the traits of considerable likeness with competitive actions (by the kinematic structure of movements and by the regime of muscle tensions) they differ from the former by the value of tensions and (or) the degree of selective effect.

For instance, javelin throwers use 2-3-kilogramme shots (masters—up to 4 kilogrammes), recreating the elements of the structure of movements essential for javelin technique and the specific character of effort ("arched" position, whipping final effort). At the same time, a considerably greater extra weight is ensured than when throwing a javelin, hence, the heightened power of movements. Special preparatory exercises of weightlifters of the pulling type, crouchings with bars, pushing-up of bars from rest, while having certain elements in common with the elements of classical snatch and jerk movements at the same time may differ from them by a greater extra weight. Swimmers use greater efforts when immitating strokes with the use of kinematic appliances *(Fig. 9)*.

Thus,' the selection of the volume and methods of extra weights in special-preparatory exercises are restricted by the requirement not to violate their structural likeness with competitive movements, but are not restricted only by the value of efforts characteristic of the latter.

Training forms of competitive exercises are used as the means of strength training preferably with a relatively small extra weight. The external weight is expedient here only since it does not violate main structural and functional specifics of the competitive exercises.

If, for instance, when executing a high jump with extra weights (a lead belt, a vest with plates, etc.) spatial and time, rhythmic or any other characteristics of the movements and push-off phases are violated it means that the weights are too heavy and have to be reduced to a level allowing the observance of basic parameters of jumping technique (in most cases, as research showed, the critical boundary of the extra weight in high jumps is within the 3-5-per-cent limits of the athlete's weight. In sports which, by the rules of the competition, include overcoming the maximum external extra weight (weightlifting) the training forms of the competitive exercises in strength training are used mainly with extra loads the weight of which equals to 60-70 per cent of the maximally possible weight and even more.

Competitive exercises allow the perfection of the athlete's strength abilities exactly in the form and the correlation which answer the means of strength training. But they do not give an opportunity sufficiently selectively to influence certain individual strength abilities and muscle groups. In most sports the typical forms of competitive action do not ensure an optimal load regime in respect of strength training. Therefore, the composition of its means, in principle, cannot boil down only to competitive exercises.

1. 3. Determining Traits of the Methodics

The general methodological fundamentals of instilling strength abilities are evolved in detail and highlighted in special literature. This enables us to limit ourselves in this section to brief characteristics of the determining traits of methodics in an athlete's strength training.

1. 3. 1. The Methodics of Instilling Strenght Abilities Proper

A number of methodological approaches is used when a high degree of the development of an athlete's strength

abilities proper has to be ensured. Generalising them, we can reduce them to two methodological trends which combine in various correlations depending on the specifics of sports specialisation.

The first trend ("extensive" methods). It is known that if an exercise with a moderate extra weight is repeated as many times as possible, the degree of muscle tension at the final stage of repetitions "right up to the hilt" will be maximum. And not only in the subjective sense. A number of physiological characteristics of the functioning of muscles becomes approximately the same as when lifting a maximum weight (the number of motor units, drawn into the work, the frequency of nervous and effector impulses, is increased together with fatigue in repeated motions). One of the non-ultimate extra weights with an ultimate number of recurrances is based on the use of this effect. It is widely represented in various sports, especially at the first stage of the preparatory period.

The methods corresponding to the given trend of strength training may conditionally be called "extensive". The training effect necessary for instilling strength abilities is attained by using these methods usually toward the close of a relatively prolonged series of recurrences (all the previous part of the work has been done as if "in vain", if it is to be evaluated from the positions of the effect on strength abilities), therefore, considerably more energy expenditures are inevitable than in other methods of strength training. Nevertheless, the extensive methods are quite justified when used in sports training, in particular, when it is necessary:

—to increase the athlete's physiological muscle diameter and body weight, which is an important prerequisite of maximum strength;

—functionally to prepare the athlete's organism to subsequent strength loads of a heightened intensity (at the first stages of engaging in sport and at the beginning of the preparatory period of training cycles) and to maintain the level of the general strength preparedness reached;

—to ensure the development of strength abilities proper and of strength endurance.

The ultimate number of repetitions in one series when using extensive methods of instilling strength abilities

proper make up, depending on concrete circumstances, approximately from 5-6 to 10-15 (corresponding to this is 80-60 per cent weight counting from the maximum external extra weight). If it is envisaged to increase strength abilities without considerably increasing the athlete's weight, the number of repetitions in a series is limited usually to 4-6, correspondingly increasing the weight of the extra load. When it is necessary to stimulate muscle hypertrophy, to increase the physiological diameter of the muscles and the general weight of the athlete's body, the norm of repetitions in a series makes up approximately 8-12 (with extra weight of 70-75 per cent from the maximum). Such a dosage, judging by practical and written data, creates favourable conditions for activising the metabolism processes in the muscles accompanied in the rehabilitation period by an intensified synthesis of protein structures.

Other typical moments of rationing loads with the use of the discussed methods are characterised by the following parameters: the number of approaches in each exercise—3 and more (depending on the number of repetitions in each series), rest intervals between them—60 to 180 seconds, the number of exercises in a separate training session—2 to 4.

The second trend ("intensified" methods). Systematic overcoming of the extra weights demanding ultimate mobilisation of the athlete's strength abilities, i. e., extra weights impeding movements with a force equal or nearly equal to the maximum force which the athlete is capable of at his current level of training plays an important role in perfectioning the athlete's strength abilities proper. The special effectiveness of these extra weights as factors of strength training is physiologically explained by the fact that the intensity of the organism's response reaction to the action of the external irritant is proportional in certain limits to the force of the irritant, which in this case is the degree of an extra weight (the greater, for instance, the weight of the bar being lifted, the more frequent is the resulting pulses and the number of muscle units drawn into the work).

The methods of strength training based on the use of ultimate and near-ultimate extra weights may be called "intensified". They express a main tendency of the me-

thodics of instilling strength abilities in a number of sports requiring ultimate strength manifestations (above all, in weightlifting) and relate to a number of basics in other sports, when resolving the tasks of considerably increasing the level of the athlete's strength and speed-strength training. Approaches must be distinguished within the limits of the given methodological trend connected with the use of dynamic, static (isometric) and combined regimes of the muscle tensions.

The dynamic exercises with near-ultimate and ultimate extra weights. The greater part of strength exercises is characterised by the dynamic regime, including when they are performed with ultimate extra weights.

The main range of extra weights when using intensified methods, lies approximately within the borders from 80-90 to 95-97 per cent in relation to the maximum. Less significant extra weights are introduced only as "warm-up", or as short-time shifts in the course of the exercise. The number of preliminary approaches is relatively small (frequently only 2-3 with qualified athletes, excluding the warm-up in the initial part of the session).

If the aim is to reach the highest strength abilities, the number of exercises with near ultimate and ultimate extra weights may reach in a separate training session 6 and more. The number of approaches in each exercise is also 6 and more (with variations, depending on the level of the athlete's preparedness, the degree of localising the effect and specifics of sports specialisation). The number of repetitions in each approach is not great since it is limited by a great extra weight (at the initial approaches it is usually limited to 2-4 repetitions, in the following—two, until it is possible while adding extra weight).

Rest intervals between the approaches with such rating of load must ensure the rehabilitation of work capacity to the extent when the athlete in his next approach can overcome a considerably greater extra weight or at least manage the same weight. Practically, qualified athletes have 3-5 minute rest intervals (weightlifters of heavy divisions, as a rule, have longer rest periods than lighter athletes). During rest intervals, if acute fatigue does not prevent it, it is expedient to perform exercises "on loosening up" and "on extension",

facilitating rehabilitation during strength loads.

Although the main line of the dynamics of extra weights in the methods discussed is to approach the maximum in the course of the exercise, it is expedient somewhat to vary the values of extra weights. One of the widespread methods of varying is to ration extra weights in the series of approaches with wave-like deviations from the main training weight by 5 to 10 per cent (for instance, 2-3 approaches to the main weight, 1-2 approaches to the weight reduced by 5 to 10 per cent, 2-3 approaches to the main weight and so on). This allows an increase in the overall volume of load and at the same time lessens the cummulative effect of fatigue, which sets in as the number of approaches with greater and greater weight increases. A number of methods of alternating the kinds of strength exercises during a training session is practiced with the same aim (by their directiveness at the main muscle groups—in the case of local exercises—by their tension regime, etc.).

The number of training sessions with an intensive strength loads, when there are considerable shifts in the development of strength abilities, makes up 3-4 and more in a week (with those who are not specialising in weightlifting they are held, mainly, every other day and periodically two days in a row). Their frequency depends again on the general load volume, the degree of selectivity of actions and on other circumstances. If the sum volume of strength loads in each separate session is relatively small and they mostly have a local character, they can be introduced daily into training sessions. However, maximum extra weights in exercises with general effect, despite a limited volume of loads (several attempts in each case), are introduced, as a rule, maximum 1-2 times a week, even in the case of weightlifters. The thing is that truly ultimate extra weights entail not only maximum muscular effort but also emotional tension. Therefore, their frequent use increases the possibility of the "safeguarding retardation", reaction coordinating violations and such like unwanted effects. That is exactly why the training work in the discussed methods is conducted mainly with sub-maximum extra weights.

Isometric and combined regimes of strength exercises. The methodics of the athlete's strength training based on the use of ultimate weights

includes the so-called *"isometric training"* as one of the additional sections.

Isometric (static) exercises as factors of strength training of an athlete have definite advantages. The main part of them—a possibility of directly accenting and prolonging the moment of maximum muscle tension, which in the dynamic regimes is quite short (at times only fractions of a second). This increases the possibility of a direct adaptation to such tensions. It is also essential that the static exercises allow selectively to influence different muscle groups, emphasising the effort moment in this or that position of the links of the motor apparatus. Special-preparatory static exercises may be selected so that the effort is accented in the main, or critical, moments of the competitive actions (for instance, at the final moment of shot putting, or at the moment of snatching the bar, when the athlete's external strength is minimal). Many static exercises do not require complicated equipment and can be used for maintaining the training state of muscles in most diverse conditions, including while riding on a bus. This is especially important for the athletes who participate in many competitions connected with a lot of travelling.

Isometric exercises cannot, however, play the main role in the athlete's strength training, since the dominating regime of strength manifestations in sport is dynamic. There are a number of other circumstances restricting the use of isometric exercises. According to most experimental data these exercises give in the final analysis a relatively lesser increment of strength indices, than dynamic. The attempt to develop strength abilities only by way of isometric training may relatively quickly (on an average in 6-8 weeks) lead to a stabilisation of strength indices. The shifting of the training level from the preparatory static exercises over to the athlete's competitive actions is frequently rather small due to the differences of the nervous and muscle coordination, as well as biochemical and morphological adaptation in the isometric and isotonic regimes of the muscle activity.

Practical experience and certain experimental facts allow to regard more or less substantiated the following recommendations in the methodics of isometric exercises. When there is a necessity to speed up the increment of the

indicators of the "static" strength it is expedient to include isometric exercises up to four times a week, giving approximately 10-15 minites for them. About six exercises (in various positions) can be performed in this time, repeating each of them 2 or 3 times. It is recommended to rate the moment of isometric tension at 5 to 6 seconds. It is important that the effort is increased gradually reaching the maximum by th 3rd or 4th second. If the athlete has been previously adapted to strength loads, the effect of the exercise can be enhanced by immediately repeating the same effort (2 or 3 times with an interval of several seconds). There must be a 1-3-minute rest before the next exercise.

The rational use of isometric exercises is also conditioned by:

—carrying them out during rest intervals between static efforts of breathing exercises in loosening up and extension;

—optimal combination of isometric loads with the main components of the content of the training sessions; dynamic exercises in the structure of exercises must, as a rule, precede isometric (not counting episodic inclusion of isometric tensions before speed-strength actions, which sometimes act as a stimulating factor, and in certain other cases);

—the use of training stands with indicators allowing control of the magnitude of the strength applied;

—stage-by-stage change of the set of isometric exercises used (particularly, by changing the initial positions) with an approximate periodicity of 4 to 6 weeks. To a certain extent this prevents diminishing the effect of the isometric training while adopting to static exercises.

The desire to combine in one method the strong aspects of the isometric and dynamic load regimes has led to the evolvement of combined "dynamic and static" exercises serving as one of the additional factors of the athlete's strength training. An elementary example of such exercises—squatting with the bar on the chest or shoulders with a rated holding in the intermediary positions. Generally, overcoming, static and yielding regimes of muscle tensions, passing over from one to another, may combine in the dynamic-static exercises in different variants. More

often than not these exercises are executed on training stands equipped with special devices.

1.3.2. The Specifics of the Methods of Strength Training in Instilling Certain Complex Abilities

It has already been noted that strength training proper makes up only one of the aspects of instilling the athlete's strength abilities. Depending on the specifics of sports specialisation, this aspect of training is combined in different relations with the instilling of speed and strength abilities, strength endurance and with other specifics of a complex nature. If the sporting result in the selected sport is not dependent on absolute strength, strength training proper is subordinated to other aspects of the athlete's training. This finds its reflection in the methods of instilling strength abilities.

In sports the achievements in which are determined not so much by absolute strength as by the speed of movements, the leading trend of the athlete's strength training is instilling speed and strength abilities.

It is known that their development is pre-conditioned by the development of strength abilities proper. At the same time these maximum indices of the speed of movements are not directly proportionally connected with the maximum strength applications. On the contrary, from the mechanical point of view, they are in a reverse dependence. In this connection, when instilling speed and strength abilities the external extra weights must be limited in a way different from that when instilling strength abilities proper.

The methods of instilling speed and strength abilities is characterised in the absolute majority of sports by the use of non-ultimate extra weights and in all sports—by setting at maximum possible speed or acceleration the actions performed. The general rule of rating the additional extra weights is to increase them only if it does not lead to an essential reduction of the speed of movement relative to the speed of competitive actions. In principle, the greater the degree of extra weights an athlete tackles during the competition in selected sport, the wider can be the range

of the expedient increase of training extra weights instilling speed and strength abilities and vice versa. Thus, weightlifters perform speed and strength exercises with extra weights approaching the ultimate one (70 to 80 per cent of the maximum and higher), basketballers use such extra weights in small volume (as a factor of general strength training) and rarely exceed 20-30 per cent of the individual maximum.

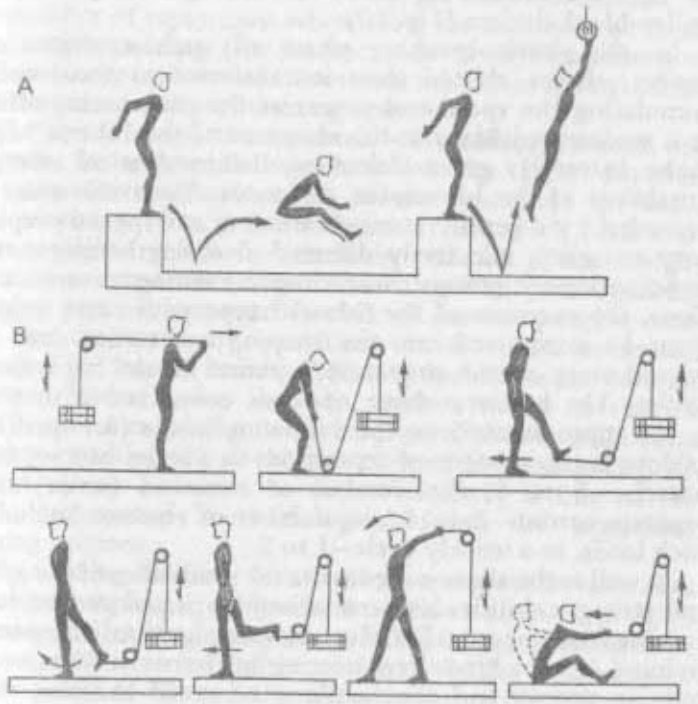

Fig. 10. Examples of the "shock" type exercises.
A—jumping exercises; *B*—exercises with the external extra weights.

Preparatory exercises with "explosion" efforts (of the type of jerking a bar, discus throwing, jumping, etc.) are given prime importance while selecting the means of the directional effect on the speed and strength abilities. In

recent years increasing attention is focused on the exercises of the so-called "shock" type, intended for affecting the reactive properties of the motor apparatus. The distinguishing feature of these exercises is to stimulate the power of the overcoming efforts with the help of inertia forces, which are created in the preceding phases of action and which force the muscles to function at first in the yielding regime as, for instance, when jumping up after jumping down with an external extra weight or when lifting a weight on the pulley-block devices *(Fig. 10)*.

In the shock-absorbing phase of such exercises the energy of the shifted mass is transferred to the muscles stimulating the speed and power of the overcoming effort. It is understandable that the exercises of the "shock" type make extremely great claims on the mechanical strength durability of the locomotor apparatus. Their use must be preceded by a general strength training and special-preparatory exercises, selectively directed at strengthening corresponding muscle groups. According to existing recommendations, the exercises of the "shock" type with extra weights must be introduced into the training not earlier than the second stage of the preparatory period of the big training cycles. The border volume of loads connected with them is set approximately at the following limits (for qualified athletes): the number of repetitions in a series of a separate exercise—5 to 8, the number of exercises (series) in a separate session—3 to 4, the number of sessions, including such loads, in a weekly cycle—1 to 2.

As well as the above-noted traits the methodics of the speed and strength abilities is characterised by partial peculiarities, ensuing from the specifics of sports specialisation. This part of training, being a kind of connecting link between the strength training proper and the instilling of speed abilities, must reflect the peculiarities of the speed and strength relation.

The character of the requirements sports specialisation makes on his endurance, especially in sports distinguished for great duration of competitive exercises, has an essential effect on the content and methodics of the athlete's strength training.

The instilling of specific strength endurance occupies a major place in strength training when specialising in such sports.

It has already been said that the higher the degree of the external extra weight which an athlete has to overcome in the course of the competition, the more his strength endurance depends on the development of his strength. Therefore, the ways of instilling strength endurance in the exercises connected with considerable extra weights, greatly coincide with the ways of instilling strength abilities proper. Special measures directed at developing strength endurance, boil down in the given case, mainly, to a certain increase of the number of repetitions when using the extensive methods of strength training (for instance, up to 15 in a series), as well as to the increase of the overall volume of strength load and motor intensity of training session.

The specifics of the methods of instilling strength endurance in sports distinguished for the great duration of competitive exercises lies in the fact that the main load tendency here is the increase of the work load with extra weights relatively small in volume. Extra weight is rated so that the duration of the load phases during training possibly approaches that of the competitive exercise (in the series of repetitions or as a sum in several series). The "round training" (it may include as the content of one "round", for instance, with a rower or skier 8 to 10 exercises of the local or general action with extra weights reaching 20 to 40 per cent of the maximum, repeated up to 30 times at each "station") is one of the most widespread methodological forms of organising training sessions.

When using training forms of the competitive exercises performed during a competition without an extra weights (running, swimming, etc.) in instilling strength endurance, it is expedient to introduce an extra weight in a measure which will not distort the main motor skill. Taking this into account, the coaches at present use less frequently the methods of a loosely reglamented extra weight (running with an arbitrary weight, running across deep snow, etc.). They are replaced by the methods of a precise rating of extra weights, connected with the use of special technical means (for instance, runners have a mobile device in the form of a wheel on a cable, which creates a precise resistance when the athlete pulls it along, without violating his running technique; swimmers—dynamometric expanders

which create resistance when doing swimming movements; cyclists—a device regulating resistance while pedalling).

2. INSTILLING SPEED ABILITIES

2.1. The Setting of Tasks

A generalised term "speed" has long been used to denote the athlete's qualities indirectly determining the speed characteristics of his actions. In the last few decades it is being more and more often replaced by the term "speed abilities". The thing is that research of the concrete forms of manifestation speed reveal their essential differences. The following aspects are singled out as speed abilities:

—the speed of the simple and complex reaction (measured by the latent time of reaction);

—the speed of separate motor acts (measured by the speed and acceleration volumes when executing separate exercises, without external resistance);

—the speed manifested in the tempo (frequency) of movement (measured by the number of movements per unit of time).

It is known that the factors lying at the basis of these abilities are not simple. The speed of the motor reactions is determined, above all, by the properties of the distant (visual, hearing) and other analysers, the dynamics of the central nervous processes and the nervous and muscle relations. Its mechanisms differ depending on the degree of the complexity and the type of motor reaction (simple and complex, visual-motor, and so on). The speed of separate movements is conditioned (alongside with the central-nervous factors) by the contractive properties of the muscle apparatus. Speed revealed in the tempo of movements depends also on the degree of complexity of the coordination mechanisms making up a system of motor acts (for instance, in sprint), biochemical and other factors restricting the maintenance of the given tempo of movements (speed endurance).

Most sports demand the entire complex of speed abilities but not in the same degree, in different correlations and forms. Hence, the specifics of the tasks for their instilment

in the representatives of various sports. A number of main groups of sports may be divided in this aspect into several groups:

1. Sports demanding maximum manifestation of all or most of the speed abilities in varying situations (sports games, encounters, slalom, etc.).
2. Sports, demanding maximum manifestation of most of the speed abilities in relatively standard situations (sprint, athletic and acrobatic jumps, throwing with a run-up, etc.).
3. Sports demanding maximum (or close to maximum) manifestation of speed abilities in conditions of a considerable external weight (weightlifting, putting the shot, throwing the hammer, etc.) or in the composition of a set of movements difficult in coordination with a standardised structure (gymnastics, figure skating, etc.).
4. Sports in which the showing of speed abilities is limited in a decisive measure by endurance (long-distance running and other sports with ultimate requirements to endurance).

When specialising in one of the sports of the first two groups, a possibly higher degree of the complex development of speed abilities have to be achieved in the process of many years of training. Their versatile instilment must make up the main or one of the main sections of the training content. The prevention or overcoming of the "speed barrier", the appearance of which is facilitated by standard conditions of the ultimate manifestation of speed, is the specific problem in these sports. The instilment of speed abilities in those specialising in the sports of the third group also occupies a considerable part in training, but has a relatively narrow directiveness. It is treated mainly as one of the aspects of instilling speed, strength, coordination and other abilities. In those cases when one of the sports with ultimate requirements of endurance is the subject of specialisation the tasks of instilling movement speed are resolved in a decisive dependence on the instilment of speed ability (instilment of the speed of motor reaction presents no problem here).

According to the general opinion of specialists, speed abilities can be developed only with great difficulty and in a considerably lesser degree than any other physical abilities (the fact that sprint records grow much slower than in

other sports is an indirect illustration of this). It is expedient to spend much time and effort for the sake of small shifts in the development of separate motor abilities only when without it it is impossible to ensure the growth of results in sport. In principle, movement speed can always be increased not only by influencing speed abilities proper but also by other means, in particular, through the instilment of strength and speed-strength abilities, speed endurance, perfectioning movement technique (this is widely used in the process of training).

It must be borne in mind that the range of mutual transfer of speed abilities is rather limited. Very often obviously different forms of speed manifestation (for instance, the speed of simple reaction and the movement speed with weights) do not correlate with each other, but also outwardly similar speed manifestations in the composition of the same system of movement.

2. 2. Instilling the Speed of Motor Reaction

Instilling the speed of the simple motor reaction. The perfectioning of the simple motor reaction must be given constant attention when specialising in sports requiring in the starting phase of the competition or in its course an instant response by an action pre-conditioned beforehand to a specific signal or a situation (starting pistol shot, referee's whistle, the appearance of a target in rapid-fire shooting, etc.).

A recurrent reaction by the action to the suddenly appearing (pre-conditioned) irritant with the setting to cut down the reaction time is an elementary basis of the methodics of instilling the speed of the simple motor reaction. As a rule, the reaction is not isolated but is executed in the composition of a directed motor action or of its element (a start, an attacking or defensive action, etc.). Various exercises including simple and complex forms of the identification of speed abilities can facilitate the improvement of simple reactions in the selected sport up to a certain degree. The range of transferring the speed of motor reactions of different types, as well as transferring the speed of movements over to the speed of the simple motor reactions is quite wide at the beginning. This justifies the use at the first stages of its instilment in representatives of various sports a set of similar means (in particular, sprint exercises, basketball and in other highly dynamic games). The degree of the development of the speed of simple motor reaction achieved on this basis is very often sufficient for the athlete if he is specialising in sport demanding its maximum.

It is rather difficult to reduce the time of the simple reaction considerably. The range of the possible reduction of its latent time over the period of many years of training is approximately 0.10-0.15 sec. In resolving this task the coach regularly includes in the training exercises "developing reaction speed". They are executed in lightened conditions (taking into consideration that the time of reaction depends on the complexity of the following action, it is singled out from the complex forms of actions together with the movements directly connected with it and worked on independently, introducing lightened initial positions and so on), as well as in varying situations (varying signal irritant in force and in time of action, changing forms and conditions of an exercise) and in the conditions maximally approximated to competitive ones in combination with the methods of special psychological training.

Not very high efficiency of practiced methods of instilling the speed of reaction makes coaches seek non-traditional approaches. The idea of the so-called "sensor method" appeared a long time ago but so far found no wide practical realisation. It is based on the dependence of the motor reaction on the ability to differentiate time microintervals (tenth fractions of a second and less) and envisages a directed perfectioning of this ability so as to ensure the transfer of precise time differentiations to reaction speed.

Practically it is expressed in the execution of three-stage system of assignments: at the first stage, the athlete reacts to the starting signal as quick as possible each time receiving information from the coach about the actual time of reaction; at the second stage, a self-estimation is introduced of the reaction time by the athlete, which is immediately compared with the coach's estimation; at third stage, when these estimations begin to coincide in most cases, the coach introduces assignments on precisely varied reaction time.

The development of modern computers and other devices

allowing prompt objective information about the latent period of reaction and in certain cases stimulate its speed, opens up new possibilities in rationalising the methods of instilling the speed of motor reaction.

Table 13

The Time of a Motor Simple Reaction to Different Irritants (Signals) in Highly Qualified Athletes and Non-Athletes (according to the generalised data of different authors)

Contingent	Signal--irritants	Reaction time (sec.)
High-class athletes	Sound	0.05–0.10
	Light	0.10–0.20
Non-athletes	Sound	0.15–0.25 and more
	Light	0.20–0.35 and more

Note: The time has been registered from the moment the signal was given to the beginning of movement; the smaller of the values given characterising the time of the reaction in high-class athletes are related to the best indices of sprinters, jumpers and other representatives of the speed-strength sports.

Instilling the speed of complex motor reactions. The requirements connected with the speed of complex motor reactions are the highest in sports characterising by a constant and sudden change in situations of actions (sports games, encounters, slalom, downhill skiing, motorcycling, etc.). Most of the complex motor reactions in sport are the reactions of "selection" (when out of several possible actions the athlete has to select the one adequate to the given situation). In a number of sports such reactions are at the same time the reactions "at the moving object" (a ball, a puck, sports weapon, etc.).

In previous chapters it has been shown that instilling the speed of complex motor reactions is an important component of the sports-technical and tactical training, especially in sports such as sports games and encounters. The main ways of its perfectioning are the modelling in the course of training of integral situations and a systematic participation in competitions. However, because of understandable reasons, it is impossible to avoid the cost of a selectively-directed effect influencing the factors of the complex reaction. Specialised means and methods are

required for this purpose.

In special-preparatory exercises, aimed at the development of the speed of complex reactions, separate forms and conditions of its manifestation in the selected sport are modelled. Special conditions are created which facilitate the reduction of reaction time.

When instilling the speed of reaction at the moving object (RMO) special attention is paid to the reduction of time of the initial reaction component—discerning and fixing an object (for instance, a ball or a puck) in the field of vision. This component is the typical for the sport cases, when the object appears suddenly and moves with a great speed (at times up to 50 and more metres per second), consumes the greater part of the total time of reaction—usually considerably more than a half. There are two main ways of reducing it:

1) by instilling an ability to grasp and "keep" the object in the field of vision beforehand (when, for instance, the ice hockey player can keep the puck in his field of vision without losing it even for a moment—his RMO time is reduced by the entire initial phase as if "by itself"), as well as the ability to foresee beforehand all the possible movements of the object (so-called, anticipating reaction). Such abilities are instilled in the process of perfectioning of technical and tactical actions and execution of the special-preparatory exercises;

2) by directively increasing the requirements of the speed of perception and other reaction components on the basis of introduction of the external stimulating factors.

The time of the selection of reaction, as is known from the applied psychology, greatly depends on the number of alternatives of the choice, or, in other words, on the possible variants of reactions out of which only one has to be selected.

If, for instance, a boxer or a fencer knows precisely that his opponent can use in the given situation only one attacking element, the uncertainty of the choice of response is minimal and the reaction time may not practically differ from a usual reaction. When it is difficult to surmise to what action an opponent will resort, the uncertainty is rising and the time is increasing correspondingly.

Taking this into consideration when instilling the speed

of reaction, the coach, first of all, tries to teach the athlete to use artfully the "latent information" about the possible actions of the opponent, which can be gleaned watching his stance, mimics, preparatory actions, the general manner of conduct, etc. Experienced athletes at times demonstrate an amazing art of precisely foreseeing by subtle signs the opponent's actions and parring them with an expedient reaction.

Using special-preparatory exercises for perfectioning selection reaction the selection situations (number of alternatives) are made more and more complicated. For this purpose the number of variants of actions allowed to the partner (in pair and group exercises) are increased gradually in a definite order together with the number of response actions. A simultaneous perfectioning of sports technical skills, replenishing their amount, instilling coordinating abilities and tactical thought are a necessary prerequisite of this method.

A number of training devices find an ever greater use in the methods of instilling the speed of complex reactions. The most general idea of their use is to lend the external factors, evoking a reaction, a systematic and strictly directed character and to make the reaction controlled and possibly regulated, thus ensuring a high degree of its perfectioning. To these training devices belong, for instance, the electric targets for boxers and fencers, supplied with programmed and measuring and registering blocs enabling them to various programmes of the selection reaction and to obtain objective information about it. Similar devices are used for handballers (with an electric board imitating the goalmouth), volleyballers (with the imitation of blocking screens above the net), and for other sports. The devices of the type of automatic cannons and catapults for launching balls and pucks with a given speed and frequency equal to their maximum speed in the usual game conditions or even greater constitute another group of devices. Such training devices permit strictly definite demands on reaction speed to the moving object and allow to organise them in a regime advantageous for its development. Taking into account that the range of the "transfer" of certain kinds of complex motor reaction is probably rather wide, use is made of training devices which are not connected with execution or imitation of real competitive actions. We have

had successful experience of the use of a table reaction-metre for tuning the forestalling reaction in training high-class fencemen.

2. 3. Instilling the Speed of Movements

Concretising the tasks. The speed of movements is not practically manifested in its pure form. Its external manifestation—the speed of motor acts—is always conditioned not only by the speed, but also by other abilities (strength, coordinating, endurance, etc.). Nevertheless, it would be wrong to identify the tasks of instilling the speed of movements with the tasks of instilling all these abilities. Although they are resolved in their unity, each of them has specifics of its own.

While instilling the speed of reaction the development of those motor abilities have to be ensured upon which the ultimate movement speed directly depends (besides other influencing factors). The specifics of the tasks of instilling movement speed lie exactly in this.

These tasks acquire different content depending on the specifics of speed identification in the selected sport. Thus, in the cyclic speed and strength sports speed, as is known, is identified mainly in the speed of motor acts (snatch, jerk, throwing, pushing off in a jump, etc.). The tasks of instilling movement speed greatly coincide here with the tasks of instilling speed and strength abilities. The greater the volume of extra weight in a competitive exercise, the more the realisation of the tasks of instilling speed is connected with the athlete's strength training. In cyclic sprint sports and in a number of sports with combined composition of actions, in which together with the speed of separate movements they have to be repeatedly executed at a high tempo, the tasks of instilling speed are especially closely linked with the tasks of instilling speed endurance. In sports, the sporting achievements do not directly depend on the ultimate manifestation of speed, its development is ensured to the degree necessary as a prerequisite of sports perfectioning.

Specifics of the composition of the means. Exercises executed with ultimate or near-ultimate speed can serve as

the basic means of instilling movement speed. Characteristic for such speed exercises proper are short duration (up to 20-30 sec.), relatively small value of the external weights or their absence (recall that the external manifestation of strength and speed maximums are related in reverse proportion).

Sprinting exercises, jumping exercises and games with expressed acceleration moments (basketball, according to conventional and simplified rules, mini-football, etc.) are most widely used as general preparatory exercises. There is every ground to regard them as an effective means of the general "speed training". However, to expect a direct transfer of speed to competitive action in the selected sport as a result of their use is justified only in the case when there is a certain community of coordinating structure of movements. Speed during an approach run, for instance in vaulting, can with a great possibility be improved as a result of sprint exercises. But it is evidently impossible to achieve the same result in respect to the speed of rotating movements on the gymnastic apparatus (in any case with qualified athletes).

It is essential thoroughly to observe the rules of structural likeness when selecting special-preparatory speed exercises. In most cases they are "parts" or integral forms of competitive exercises (in the acyclic speed-strength sports), transformed so that the athlete can surpass the speed in respect to that achieved in competition. As applied to cyclic sports a number of roughly rated normatives have been found today which help to observe optimal speed correlations at different laps of the distance *(Table 14)*.

Table 14

Approximate Normatives of Ultimate Speeds at Various Sprint Distances

Speed (m/sec.)	Running time (sec.)				
	30 m running start	30 m start			
12.0	2.5	3.5	6.4	9.9	20.2
11.5	2.6	3.6	6.5	10.0	20.4
11.1	2.7	3.7	6.6	10.3	21.0

Continued

10.7	2.8	3.8	6.7	10.5	21.4
10.3	2.9	3.9	6.85	10.75	22.0
10.0	3.0	4.0	7.0	11.0	22.5
9.6	3.1	4.1	7.2	11.4	23.2
9.3	3.2	4.2	7.4	11.7	23.8
9.0	3.3	4.3	7.7	12.0	24.5

When special-preparatory exercises with additional loads are used to instil movements speed, extra weights should be less than when instilling strength proper and speed-strength abilities. This is justified when sports exercises connected with ultimate external weights (their weight in exercises mainly with speed directiveness decreases by 20-30 per cent and more) are the subject of specialisation.

Special-preparatory exercises with and without extra weights are used in various combinations for a massive effect on the speed proper and speed-strength abilities. It must be borne in mind that if sport, competitive actions in which are executed without extra external loads, is an object of specialisation the special-preparatory exercises with extra weights will not correspond in full measure to the specifics of the combined manifestation of strength and speed in the selected sport (including in sports of the speed-strength character, for instance, in jumping). This in the given case determines the importance of a qualified selection of the speed and strength special-preparatory exercises not only with additional extra weights but also without them. Effective, in particular, may be exercises of the "shock" type, in which the athlete's weight serves as an extra weight.

A comparative experiment has shown that systematic use of special-preparatory jumping exercises of the "shock" type (jumping down and jumping out) considerably improved in jumpers a number of speed and power movement indices, than the use of traditional preparatory exercises with the bar of the kind of crouchings and jumpings.

Integral forms of competitive exercises are used as the means of instilling speed, mainly, in sports characterised by vividly expressed speed indices (sprints) or which include in their composition mainly elements with

expressed speed and speed-strength indices (athletics, acrobatics jumping, throwing, most of sports games, etc.). In other sports competitive exercises are used in the process of instilling movement speed, mainly, in the transformed form (special-preparatory speed exercises, which are similar in form to the competitive ones).

Methods and methodological elements. The methodology of instilling movement speed envisages a wide use of all the basic training methods of strictly rationed exercises, competitive and game.

The competitive method in the process of carrying out speed exercises is used (in its elementary and full form) much more frequently and in a greater volume than, for instance, in the process of strength training or in exercises demanding ultimate endurance. (By way of illustration, it is sufficient to say that with high-class athletes specialising in typically speed sports, the number of official starts alone comes up to 100-200 and more annually.) This is possible because of a brief duration of speed exercises and is explained, above all, by the fact that it is far more difficult to mobilise oneself for a maximum display of speed in everyday conditions of training than against the background of an emotional uplift created by the conditions of the competition. For the same reason athletes often resort to the game method in executing speed exercises, which prevents the formation of the "speed barrier".

However, it is the method of a strictly rationed exercise that makes up the basis of methods of instilling movement speed in the process of training, just as instilling the athlete's other abilities. They are represented by the methods of recurrent execution of actions setting at the maximum movement speed and varying exercises, changing the speed of acceleration in the given programme in specially created conditions. The specific regularities of the development of movement speed make it binding thoroughly to combine these methods in expedient correlations.

This relatively standard repetition of movements with maximum speed, while being a necessary factor in the development of speed, at the same time stabilises speed at the level reached. The functional possibilities, on which

movement speed depends, increase in the process of such repetitions probably slower than the stable stereotype of movements formed (this explains why, despite colossal effort an athlete expends on repeating speed exercises, the result remains practically the same over several years: a firmly-fixed motor stereotype shackles the realisation of speed possibilities). That is why the problem of the optimal combination of methods including relatively standard and varied forms of speed exercises occupy the central place in the methodics of instilling movement speed, along with the problem of exceeding the speed of movements which has become habitual for the athlete. When tackling these problems the following (certain) methodological approaches are used:

1. Lightening the external conditions and use of additional strength in order to accelerate movements. Reducing the volume of an extra weight is the most widespread means of lightening the conditions of displaying speed in sports exercises. Very often it allows, providing that all the methodological rules of lightening are observed, to execute the actions with increased speed (at the cost of transfer) in habitual conditions too. This approach is made more difficult in sports exercises in which the extra weight is the athlete's body weight. Various methods are used in attempts to facilitate the achievement of increased speed in such exercises:

—the athlete's weight is "reduced" by the application of the external forces.

The simplest method here is direct physical help by the coach or partner with the use of suspension cords and without them (in gymnastic and other exercises, where it is possible to use them); a training stand with suspension and transporting devices (suspension device ensures a precisely strength-regulated traction force directed upward allowing the creation of rated values of lightening) was devised to ensure lightening in such cyclic exercises.

—limitation of the resistance of the natural media (use of motorpaces with a shield in cycling, skating, swimming with the current and in sea water swimming pools);

—use of the external conditions which help an athlete transfer the inertia of the movement of his body into

acceleration (running along an inclined track, cycling downgrade, etc.);

—introduction of rationed external forces acting in the direction of running or cycling (for instance, mechanical traction in running, which facilitates quick motion, lending the mass of the athletes' body a small additional acceleration through a towing device).

2. The use of the effect of the "accelerating consequence" and varying extra weights. Practically it has been noted a long time ago and then asserted experimentally that movement speed may temporarily increase under the effect of the preceding execution of the same or similar movements with extra weights (jumping up with a weight before a high jump, pushing an extra heavy shot before putting an ordinary shot, etc.). Obviously the reason lies in the residual excitation of nervous centres, preservation of motor settings and in other processes intensifying subsequent motor actions. This may be followed by a considerable reduction of movement time and increase the degree of acceleration and the power of work done.

However, it is not always that such an effect is observed. It greatly depends on the measure of an extra weight and subsequent lightening, the number of repetitions and the order of alternating the conventional, heavier and lightened variants of the exercise.

For instance, the difference in the weight of the shot less than 250 grammes turns out to be too small for obtaining the consequential effect. It is expedient to alternate putting the shot of usual weight in the 1:2-1:3 ratio (after putting a heavier shot once proceed to put a standard shot 2-3 times), and of the usual and lighter shot in the 1:1 ratio. When combining within the framework of the same training session heavier, usual and lightened variants of the speed exercise (for instance, running along upgrade track—running along horizontal track—running along a downgrade track) their given succession, as is shown in the experiment with sprinters, facilitates the increase of movement speed from attempt to attempt to a lesser degree or not at all.

3. Leading and sensor activisation of speed manifestations. The notion "leading" here encompasses, above all, a group of known

methods such as running behind the leader-partner, cycling behind a motorcycle and so on. These methods are used to set up a visual object for achieving the necessary speed and at the same time to reduce obstacles to it (head-on air resistance).

The second group includes methods the essence of which is in giving early speed movement parameters with the help of special devices of the type of soundpacers, lightpacers and object pacers.

To these methods belong, for instance: transmission of sound signals using a conventional loudspeaker or with the help of a miniature electronic device attached to the athlete's body in order to set him the necessary pace of movement; use for the same purpose of "light tracks" (consequently switched-on electric bulbs installed, for instance, along the track, or the swimming pool's edge); pacing with the help of a mechanical "hare", which automatically moves with a given speed along the cable stretched along the track.

The idea of intensification of movements with the help of their synchronous sound accompaniment recreating an acoustic picture of the efforts expended by the athlete have acquired a methodological aspect in the last few years. This is achieved with the help of electrical technical devices which automatically register movement parameters (running speed, acceleration of the hand movement in putting the shot, etc.) and convert the data into sound signals the frequency and pitch of which change correspondingly to the speed of the movement. Such sound pacing not only informs the athlete about the character of the efforts expended by him but can also serve as a stimulating factor, accelerating the movement itself.

4. Use of the "acceleration" effect and introduction of the accelerating phases into exercises. Most of the speed exercises include, as is known, an "acceleration" period (initial acceleration in sprint exercises from the "running start", run-up in athletics, acrobatics and vaulting, initial movements in throwing, etc.). The first prerequisite of increased speed in the main phases of an exercise is in the increased acceleration speed. This may be facilitated in certain cases by the introduction of additional movements

(for instance, an additional turn in hammer throwing, shot putting). Sometimes it is expedient to introduce additional accelerating movements in the final phase of the exercise (for instance touching, before landing in vaulting, an object suspended above may facilitate acceleration of movements in the phase of pushing off from the apparatus).

5. "Narrowing down" of the spatial and time limits of executing exercises. Taking into consideration that the general level of speed manifestations in the motor activity is rigidly limited by its duration, the given limitations both of the overall time of the exercise and the spatial conditions of its execution are introduced in the process of instilling the speed of multiple movements.

Thus, the distance is shortened in cyclic exercises (relative the competitive one), the time of the play or a bout and the size of the court are limited in sports games and encounters (game exercises in "squares", bouts on a smaller rink, etc.). This is done to speed up the movements of players on the court or of boxers in the ring. Despite the seeming simplicity of such an approach, it plays quite an important role in the total complex of methods of instilling speed abilities.

On the session's regime. The volume of speed exercises within the framework of a separate training session, as a rule, is relatively small even with those specialising in speed sports. This is conditioned firstly, by the ultimate physical and psychic intensity of the exercises; secondly, by the fact that it is not expedient to execute them in a state of fatigue, leading to the drop of movement speed (if the aim is to instil speed abilities and not endurance). Rest intervals in the series of speed exercises must be such so that the athlete can perform his next exercise with speed just as high as the previous one (or at least a just bit lower). It takes a well-trained athlete 5 to 8 minutes for sprint exercises covering distances up to 100 metres, if the number of repetitions is not great. As the number of repetitions increases the interval is lengthened so that the overall training regime becomes too sparse. This circumstance also limits the volume of speed exercises in a separate session. In the intervals between speed exercises it is recommended, beside passive rest, to do light movements, similar in form to the main exercise (for instance, jogging or walking

between accelerations or imitating a throw–between throwing with full force), so as to maintain a psychomotor "tuning" for action.

In a week's training regime optimal conditions for the development of movement speed are created, judging by certain model experiments, when the sessions are held practically every day. It is understandable that actually there is a number of circumstances limiting the possibility and the expediency of daily speed exercises. Their frequency depends, in particular, on the specifics of sports specialisation, the level of the athlete's preliminary training, the budget of the total time at his disposal. However, in the periods when it is necessary to ensure a considerable development of the movement speed, speed exercises have to be included as often as possible into the microcycles of training, limiting at the same time their volume in each training session. This does not concern the initial stages of big training cycles when prerequisites are created for the effective use of concentrated speed loads at subsequent stages.

3. INSTILLING FLEXIBILITY

3. 1. The Tasks and Restricting Conditions When Instilling Flexibility

As distinct from the athlete's strength, speed and other motor abilities, flexibility does not belong to the causative factors of movements, but to morpho-functional properties of the locomotor system, which precondition the degree of mobility of its links relative to each other. Flexibility is shown in the swing (amplitude) of bendings and straightenings and other movements allowed by the joint structure. It is also measured by maximum movement amplitude.

Potentially possible flexibility indices are limited by the anatomical peculiarities of this or that joint and of the ligamentous system. Actually movement amplitude is limited, first of all, by the tension of the muscles-antagonists. Due to this flexibility indices depend on the ability to combine loosening of the extended muscles with the tensing of moving muscles. The development of flexibility does not

boil down to a simple perfectioning of the intermuscular coordination but includes a number of specific morpho-functional changes on the basis of perfectioning the elastic properties of the muscles and ligaments. The forms of the articulated bone surfaces change in the process of a many-year specialised development of flexibility.

As is known, the greatest pace of development of flexibility under the effect of directed influences is observed in children and teenagers. If the flexibility of all the links of the locomotor system is brought at these stages to amplitudes, allowed by the normal joint structure, its further increase becomes pedagogically inexpedient, including sport. Excessive development of flexibility leads to an excessive irreversible deformation of joints and ligaments, distorts stance and adversely affects motor abilities.

The main tasks in instilling flexibility in the athlete in the process of many-year training consists, first of all, in ensuring its perfectioning as applied to the demands of sports specialisation and, secondly, in maintaining its indices at the optimal level achieved.

Resolving these tasks, the athlete does not have to work constantly for increasing flexibility indices. It is expedient to increase them only to a degree which is required for the formation of the optimal movement technique and maximum resultative use of motor abilities in the selected sport. It should be borne in mind that it is not always necessary to expand the amplitude of movements attained earlier. It should be done mainly when the athlete masters new movements which have higher specific requirements to flexibility and in case it has not been sufficiently developed at previous stages of physical education (before the beginning of sports activity).

The optimum degree of the development of an athlete's flexibility is characterised, in particular, by the fact that the movement amplitude within his reach somewhat exceeds the amplitude's size in competitive exercises (exclusion, understandably, are the cases where movements in the composition of the competitive actions have ultimately accessible amplitude). This, so-called "flexibility reserve" (or to be more exact "reserve tensility"), allows, within the limit of the observed amplitude of movements, a reduction to the minimum the resistance of the extended muscles.

Thanks to this the exercise is executed without an excessive tension, more sparingly. Moreover, the reserve tensility serves as one of the main guarantees against injury.

Flexibility indices in passive forms of its manifestation (so-called "passive flexibility") usually exceed its indices in active movements (so-called "active flexibility"). The greater this difference, the greater the reserve tensility, and, therefore, the possibility of increasing the amplitude of active movements. This difference diminishes, as a rule, in the process of sporting perfectioning as a result of the increment of the amplitude of active movements on the basis of the combined perfectioning of the athlete's flexibility and strength abilities. The athlete must work for an increase of the amplitude of passive movements in most cases since it is essential for the perfectioning of the "active flexibility" (exclusions are the cases when exercises have to be mastered which are specially intended for demonstrating maximum flexibility indices, for instance, in gymnastics, or it is necessary to restore normal flexibility in joints lost due to some reason, for instance, because of an injury).

The requirements to flexibility are most considerable and versatile in gymnastics and rhythmic gymnastics, acrobatics and figure skating, in which it is one of the qualities demonstrated in competitions and taken into account when evaluating sports results. When engaging in these sports thoroughly, the athlete tries to bring the amplitude of movements in all the basic links to a rational maximum, which is determined in the final analysis by the regularities of the harmonious perfectioning of the locomotor system and which depends on the adopted criteria of sporting mastery, including aesthetic (expressiveness of movements and so on).

To ensure an optimum correlation of flexibility and the athlete's leading motor abilities, negative interactions, which may arise in the process of their development, have to be prevented. Special attention has to be paid to this especially in sports requiring a high mobility of the main links of the locomotor system in conditions of ultimate static and dynamic strength tensions (weightlifting, wrestling, partially gymnastics). Hypertrophy of the muscles and other morpho-functional changes taking place in the process of the maximum development of strength abilities

may restrict the amplitude of movements if not countered by a directed instilling of flexibility. Thanks to the rational combination of the correctly selected means of training, flexibility indices may not only be preserved but increased when specialising in strength sports. A number of sports demand ultimate amplitude of movements only in certain links of the locomotor system and in certain directions (for instance, in the javelin throwers' shoulder joints and in the hurdlers' coxofemoral joints). In such cases a simultaneous strengthening of the corresponding links of the locomotor system have to be ensured with the maximum development of flexibility. In all other sports, too, any excessive increase of flexibility in joints violating their normal structure must be avoided.

If the athlete's degree of flexibility corresponds to the requirements of the selected sport the main task of instilling flexibility is to prevent its regress. Concretely speaking the task is:

—to prevent readaptive worsening of flexibility, which may be caused by cessation or excessive reduction of loads, tending to its development;

—to prevent the decrease of the amplitude of movements which may happen under the effect of the hypertrophy of the muscles and of other specific morpho-functional changes connected with thorough specialisation in certain sports;

—to retard the age flexibility regress while preserving (as far as possible) the optimum mobility of the main links of the locomotor system in the process of sports perfectioning in the course of many years. It is important to take into consideration in this connection that the age involution of the joint mobility with the absence of counter-measures begins extremely early—in childhood. Thanks to constant instilling of flexibility, in principle, its age regress can be diminished and pushed back for many years.

3. 2. Means and Methods

The main means of instilling flexibility—the general preparatory and special-preparatory **exercises "on extension"**. They are all characterised by an ultimate increase of the amplitude of movements in the course of the serial

execution of an exercise. They are subdivided into active, passive and combined (active-passive) exercises.

Most of the exercises "on extension" are executed in the dynamic regime—as relative smooth movements or swing-like in combination with jerks (in the final part of the trajectory). In these cases a springy moment is, as a rule, expressed during repetitions. Use is also made of static "on extension" exercises including those with "self-gripping", of the type of the fixed bendings withdrawing one's body by the hands to the straightened out legs, splits and other stances connected with the maximum extension of certain muscle groups. Under certain conditions such exercises give the greatest increment of the flexibility indices in the passive form of its manifestation. However, they do not guarantee proportional indices of the "active" flexibility and that is why they must always constitute only a certain part of the complex of exercises "on extension". The concrete share of various elements of this complex depends on the specifics of the selected sport.

The general preparatory exercises "on extension" are selected from the basic and sports applied gymnastics, where they have been evolved in detail as applied to the tasks of the comprehensive perfectioning of flexibility. Most of them are relatively local movements: bendings, unbendings, drawings aside, leanings, turns which in their aggregate allow to influence selectively all the basic muscular and ligament groups, restricting mobility in joints. These exercises are included among the means of the athlete's general physical training with due account of the specific requirements as to flexibility in the selected sport and of the general tasks in its instilment, being concretised as applied to a stage of the sporting perfectioning.

Special-preparatory exercises "on extension" are formed on the basis of the elements of the competitive actions demanding considerable mobility of the links of the locomotor system (a swing in javelin throwing, a swing of leg when pushing off in high jumping, etc.). Usually they are performed in several modifications, the combination of which makes it possible diversely to influence the extended muscular and ligament groups *(Fig. 11)*. Competitive exercises themselves, their integral forms, as a rule, play an auxiliary role in instilling flexibility, since they are executed

in a relatively small volume and very often do not allow influencing flexibility in the regime of optimal loads in a directed way.

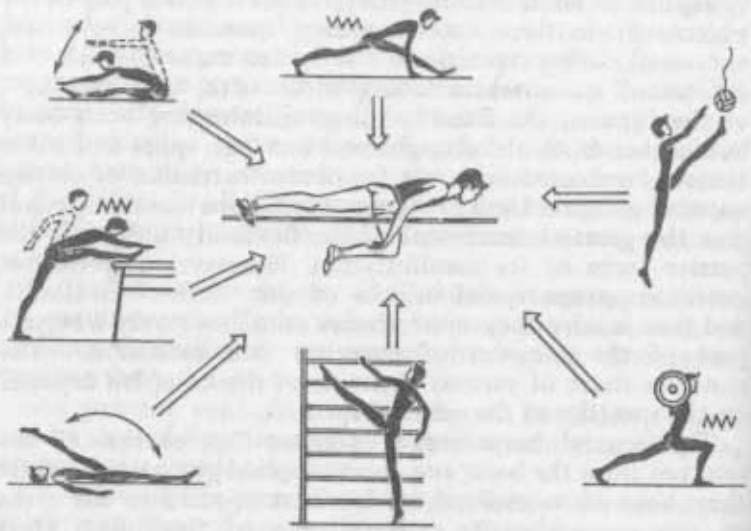

Fig. 11. **An example of a set of the flexibility exercises for high jumpers.**

A number of exercises "on extension" are used with extra loads, which intensify the effect of the tensile forces, as well as in the regime of strength tensions, directed to counter the action of the external resistance (for instance, deep bendings while overcoming the resistance of a rubber band, straightening out wrists held by a partner). Such exercises make it possible to perfect flexibility simultaneously with strength abilities and thus ensure an increment of the amplitude of the active actions in a complex. The specific share of these exercises in physical training is especially considerable with wrestlers and weightlifters.

The basic methodological propositions determining controlled loads in exercises "on extension" and the order of their inclusion into training sessions are explained below.

The dynamic exercises "on extension" are performed, as a rule, in series, with a gradual increase of the swing

of movements to the maximum. The number of repetitions making the series, is usually not less than 8 to 12, since separate short-time effect on the extended muscular ligamentous groups have but very low efficacy. The beginning of the reduction of the amplitude of movements under the effect of fatigue limits the rational number of repetitions. Well-trained athletes are able continuously to repeat the movements 40 or more times with the maximum amplitude or close to it. The static exercises "on extension" are executed with a gradual increase in the time of "holdings"—from several to dozens of seconds. The range of these controlled changes depending on the task of instilling flexibility, individual specifics of its development, the level of the athlete's initial training, his age and the peculiarities of the exercises used.*

The exercises "on extension" may be included in all the parts of the training session under the condition that they are expediently combined with other elements and are dosaged in accordance with the general rules of rating loads. In the preparatory part of the training session these exercises make up one of the components of limbering up. At the beginning they can be executed only with a shortened amplitude. It can be increased as the athlete warms up, which is attained not so much by the exercises "on extension" as by other exercises, connected with the increased heat production (running and so on).

If mass effect on flexibility is the aim of the training session, it is expedient to concentrate the exercises "on extension" in the second half of the main part, separating them into a relatively independent section. They have to be done in several series with an alternate effect on the various links of the locomotor system, in combination with the exercises "on loosening up". Where the exercises "on extension" have, mainly, a "supporting" aim or play a clearly auxiliary role (as an element of a special warm-up), they are to be executed by separate series in the intervals between the main exercises.

* In practice exercises "on extension" are being often controlled with the appearance of a light feeling of pain in the places of maximum extensions. This criterion is not strictly defined. It can be used if the athlete is well-experienced in self-control and combines it with objective indices.

Despite wide-spread opinion, certain exercises "on extension" are effective not only with optimum but also with somewhat reduced muscular efficiency. Under the conditions of muscle fatigue the indices of the "passive" flexibility may increase. This allows the use of passive exercises "on extension" against the background of the consequences of other exercises in rest intervals, as well as at the end of the main and even in the final part of the session. As distinct from this, as a rule, it is not expedient to execute active exercises "on extension" against the background of expressed fatigue, especially if it is common in character (except in the cases when the aim is to instil a specific endurance).

The volume of loads used to improve flexibility or to prevent its regress is distributed between the main and additional training sessions with additional independent sessions very often being the most convenient form of a daily inclusion of these loads, if the athlete mastered the assignments both in control and in the method of execution. They can also be executed in the morning hours. Although flexibility indices at this time are low, the exercises "on extension" do not lose their efficacy provided the athlete has limbered sufficiently.

The exercises "on extension" give a most considerable cumulative effect when they are carried out daily and recurrently in the course of the day (twice a day and more in several series of exercises). This enables the athlete to improve his flexibility considerably in a relatively short time, than with the same volume of loads distributed in time. Thus, the increment of flexibility indices in one of the comparative experiments only in ten sessions, conducted in a concentrated regime (2 sessions daily for 5 days, 30 rhythmic bendings in each session), turned out to be nearly twice as great as with the same number of repetitions and with the same number of sessions held every other day.

The stages of such concentrated loads are relatively short. According to some data, 8 to 10 weeks would be quite sufficient to realise in the main that part of the possible increment of the amplitude of movements which depends on the improvement of the muscle elasticity. The further increment of the flexibility in the joints despite the intensification of loads becomes insignificant, since it occurs

through long-term protracted adaptive changes of the osteo-ligamentous structures. This demands not so much concentrated but rather regular loads in the course of a number of stages of training over many years. After the necessary amplitude of movements is ensured, the loads connected with the exercises "on extension" assume mainly a stabilising character. Their volume may be substantially reduced (this does not relate to the periods of the age flexibility regress, when in order to maintain it more and more efforts have to be expended every year).

Chapter Eight

Physical Training (Continued); Endurance Training

1. INITIAL REMARKS AND TASKS

1. 1. The Notion, Criteria and Demands of Endurance in Sport

Definitions. The term *"athlete's special endurance"* denotes his ability to withstand fatigue in conditions of specific loads, especially with the maximum mobilisation of the functional abilities of his organism for achieving high results in the selected sport. The athlete demonstrates this ability during a training session when executing specific training exercises (it may be called a *"special training endurance"*), and during competitions in the selected sport (it is called a *"special competitive endurance"*).

The term *"athlete's general endurance"* denotes an aggregate of his organism's functional properties, which make up a non-specific basis of the athlete's endurance in various kinds of activity. It is known, for instance, that the so-called aerobic abilities of the organism are one of the bases of many kinds of endurance. "General endurance" is often likened to the endurance in long-distance running and in other exercises connected with a considerable activisation of the aerobic exchange. However, it would be wrong to reduce it only to such partial cases of its manifestation. It is, in essence, a certain aggregate of the factors gen-

eral for different kinds of endurance. The components of this aggregate may be different depending on the specifics of sports specialisation.

The external indices of the special endurance. The athlete's special competitive endurance depending on the specifics of sports is characterised by externally different integral indices. Among such are:

a) minimum time of covering a standard competitive distance and the correlation of speeds at its laps (in the absolute majority of the cyclic sports);

b) the degree of maintaining or increasing (in case of necessity) of an expedient motor activity in the course of a competition. This may be expressed:

—in maintaining the movement speed at the given or increasing volume of the competitive load (hourly running, 24-hour walking, etc.);

—in the growing indices of the intensity of efforts with the standard volume of the competitive load (in weightlifting, throwing, jumping, etc.);

—in retaining or increasing in the course of competition the number of effective competitive actions (in sports where their volume is not restricted, for instance, the number of attacks in encounters and sports games);

c) the stability of the technically-perfect execution of competitive actions (absence or minimum number of violations). This is especially important in so-called technically complex sports (gymnastics, diving, figure skating, etc.).

The indices of the sum volume of loads in special-preparatory exercises (for instance, kilometres of the training distances covered by the runner or rower, the number of lifts of the bar and its total weight in the exercises of the lifter, the total number of repetitions of gymnastic elements) allow the judging to a certain degree of special training endurance.

The integral notion about an athlete's special endurance may be formed only with due account of its integral indices recorded in real competitive, or maximally close to them, conditions. But this does not exclude the possibility and expediency of the use of special model tests for controlling the development of endurance during

training. They are combined with the appraisal of the organism's reaction to the given test load (directly in the training process—mostly by the indices of pulse reaction). The examples of such loads and the indices accounted for are given in *Table 15*. As is seen from these examples, a part of the competitive activity (running or swimming a part of the competitive distance with a given speed, repeating separate competitive actions) or exercises more or less integrally modelling it in certain respect, are taken as the basis of the test load. The task is to retain the given parameters of work intensity and movement technique within the framework of standard test load or to perform maximum work in a limited time.

Table 15

Examples of Test Loads When Evaluating Special Endurance in Various Sports and the Indices Taken into Account

Sport the athlete specialises in	Test load characteristic	Variable indices accounted for
100-200-metre swimming	Six-time 50-m swimming with the speed constituting 90 per cent of the maximum at this distance, with 10-sec rest intervals	Change of actual speed in laps, average swimming speed, functional shifts by the indices of heart beat frequency (HBF), etc.
5,000-m running	Ten-times 400-m running with the speed exceeding the competitive one by 10 per cent, with one-minute rest intervals	Ditto.
Greco-Roman wrestling	Three-time repetition of a series of throws of a dummy (imitation of the drop-back throw; 4 throws in each series during 40-sec + maximum possible number of throws in 20 sec)	The general number of throws, change of the throw time and the correctness of the execution (evaluation in points), functional shifts in heart beat frequency in HBF indices, etc.
Volleyball	Executing a complex of exercises, recreating the ele-	The total number of repetitions or time, the

Continued

	ments of play actions with a controlled load according to the rules of round training in two variants: maximum number of repetitions in the given time or the given number of repetitions in a possible short time	appearance of technical errors in the course of the exercise, functional shifts in HBF indices, etc.
Figure skating	A twice repeated "model combination" (variant of the competitive combination in which certain most difficult and insufficiently mastered elements are replaced)	The appearance of technical errors in the course of the execution, functional shifts in HBF indices, etc.

In such testing beside individual results obtained in the dynamics (for instance, over a monthly interval) in the development of endurance indices coaches try to use increasingly standard indices which in a number of sports are deduced by experimental or calculated methods, for a comparative evaluation of the shifts in developing endurance.

When evaluating in detail separate factors determining an athlete's endurance, special methods of analysis of the organism's functional possibilities are needed. Such methods are evolved, in particular, by the sports physiology and biochemistry, as well as by sports medicine. Information obtained with their help is important for diagnostics, as well as for forecasting the development of endurance. It should be borne in mind that not a single particular method can give exhaustive data about the whole and that is why it acquires a genuine value only in combination with other methods providing a generalised characteristic.

Factors and peculiarities of the manifestations of endurance in various sports. Endurance in any sport is a multifactor ability most closely connected with an athlete's other abilities. It can be said with a certain simplification that four groups of factors make up its basis:

1) personality-psychological factors which are connected with the athlete's motivation, his psychological setting at the forthcoming activity, stability of this setting, purposefulness, self-control and other will qualities;

2) factors of the energetic provision of work (organism's energy resources) and "functional power" of the systems ensuring metabolism and transformation of energy;

3) factors of the "functional stability" which allow to preserve at a certain level functional activity of the systems of the organism during the shifts in its external media which occur during the work as fatigue sets in;

4) factors of the "functional economisation" (expressed in the reduction of energy expenditures per unit of work with the increase of the training level), coordinated perfectioning and rational distribution of forces in the process of competition, on which the efficiency of the use of the organism's power resources directly depend.

The possibility to display endurance in any active sport is determined by an aggregate of the noted factors although their specific share and character in various sports have their own peculiarities, conditioned by the specifics of specialisation. Besides, endurance in a number of sports depends to a considerable degree on the athlete's strength abilities and on certain other factors.

The specifics of the requirements to endurance in various sports is expressed in the notion "athlete's special endurance". However, the differences of these requirements in some cases are essential, while in others—of relatively small importance. Taking this into account, a number of types of the athlete's special endurance can be singled out (given below are characteristics of certain main types).

Endurance of the long-distance running type (in long-distance running and in other cyclic sports, characteristic of which is work similar in duration) and close to it endurance of the "marathon type" (in marathon running, in walking, 30-50-kilometre and more ski races, 100-kilometre and more cycling, etc.) are conditioned to a considerable degree on the aerobic possibilities of the organism. Sporting results in sports requiring endurance of this type most essentially correlate with the level of the maximum oxygen consumption and with other indices of aerobic production of the

athlete's organism. Long-distance and marathon endurance more than any other type of endurance depends on functional economisation and tactics of covering the distance (rational distribution of strength). Psychologically, these types of endurance are characterised by most protracted, stable and permanent will efforts.

Endurance in middle-distance running and in similar sports, in which the intensity of competitive exercises is distinguished by the sub-maximum power—200-400-metre swimming, 1-kilometre rowing, etc., have considerably different traits. Endurance of this type can be called, using a German term, "mittelstrecker"—middle-distance. The share of non-oxygen (mainly glycolitic) processes in the general power provision of work during middle-distance running competitions exceeds the share of aerobic processes or is approximately equal to it. To achieve high results in these conditions the athlete has to continue competition despite oxygen deficiency, increasing to ultimate limits (up to 20 litres and more), the increase of the concentration of lactic acid in blood (up to 200 and more mg %) and other shifts in the organism's internal media, making work difficult. This fact, above all, determines the physiological specifics of special endurance of the given type. Psychologically, it is characterised by the ability to endure, overcome negative feelings and emotions produced by such acute shifts in the organism as it does this work. Such endurance is closer linked with the speed and strength of the athlete. However, in this case too superiority in the absolute speed and strength indices does not guarantee superiority in special endurance and sports results.

Endurance of the sprint type (in track and field sprint, in sprint cycling and similar sports) is an ability to build-up the maximum and then keep at this level the power of work in conditions of a possible short-time covering of the competitive distance, i. e., in the time limits tending to a minimum. Sprint exercises demand ultimate concentration of will qualities and abilities to ensure the border frequency of the nervous impulses alongside with the stability of the forms of movement coordination in the complicated conditions of controlling them. At the same time a considerable oxygen deficiency (up to 20 litres) and other shifts in the organism connected with it precondition

relatively high requirements to the vegetative system in the rehabilitation period, especially during major competitions, when the sprinter has to take starts with a relatively small time intervals.

The noted traits characterise partially endurance types in the acyclic sports and competitive exercises which have similar indicators as to the relative power of the physiological work. But there is no complete similarity here. A sharply variable and interrupted character of the competitive load in the acyclic sports as well as a number of their other peculiarities precondition specific requirements to work capacity, including endurance.

In such sports as weightlifting and wrestling endurance is mainly of the strength character. It has already been noted that the greater the external weight, the athlete has to overcome during competition and in general the greater the volume of strength he displays, to a greater degree its recurrent manifestations depend on the development of his strength abilities proper. However, special endurance in the given case, too, does not boil down only to strength abilities. It lies in the ability to retain and mount the power of efforts in the course of the psychologically difficult competitions, which very often drag on for several hours, to avoid technical errors, despite the growing emotional tension and general fatigue, as well as to overcome intensive training loads of great volume.

The specifics of endurance displayed in sports games (game endurance) and in encounters are preconditioned, first of all, by extreme variety, non-standard competitive actions, as well as by the impossibility of determining accurately and beforehand competitive load parametres, in particular, the general duration of competitions. This calls for a reserve of endurance calculated for a possible ultimate range of its display. Many episodes with maximum intensive movements (accelerations when moving about the court or field, attacking shots or throws, etc.) precondition the fact that sports games and encounters make considerable requirements to the systems of an aerobic power provision. At the same time a big volume of the motor activity, alternated with pauses of relative rest, demand a sufficiently high aerobic productivity of the organism.

Sports games and encounters make increased requirements on stability against sensor and emotional fatigue.

Combined event endurance has to be singled out as one of the types of special endurance (typical for athletes performing in the combined event), which in each case has its own peculiarities depending on the specifics of the combined event. Outwardly this type of endurance is displayed in the fact that the results achieved by an athlete in each exercise included in the combined event receive a possibly full realisation when the athlete performs the full programme, when a packed regime of the competitive load and inter-effect of different kinds of work impedes demonstration of the achievement in individual exercises. The harder it is to combine high achievements in different sports of the combined events, the greater is the role of instilling special combined events endurance in training the athlete performing in the combined events.

1.2. The Tasks of Instilling an Athlete's Endurance

The above-said helps to clarify the tasks which have to be resolved in instilling endurance during sports training. On the whole their essence is that by *influencing the entire aggregate of the factors, directly or indirectly determining the athlete's special endurance ensures its progressive development to a degree necessary for achieving an ultimate sporting result.*

The specific requirements to endurance in every sport, on the one hand and the community of factors underlying its various manifestations on the other, make it binding to resolve the task of its instilment in the athlete's general as well as in special training.

1. **The tasks of instilling endurance in the process of general physical training.** Briefly they can be described as the tasks of instilling so called *general endurance.* This means that in the process of general training, endurance factors have to be influenced in such a direction as to expand the functional possibilities of the athlete's organism which restrict his general work capacity, thus creating prerequisites for the total increase of the useful volume of

training work and, using the "transfer" effect, assist in developing endurance as applied to the requirements of the selected sport. When concretising these tasks, the interactions of different factors and kinds of endurance (endurance "transfer") must be taken into consideration as well as the necessity of a gradual adaptation to the growing training loads.

The instilment of endurance to prolonged and continuous work of moderate or great intensity connected with the active functioning of the cardio-vascular and respiratory systems is one of the significant sections of general physical training in most diverse sports. Two tasks are considered to instil general endurance of such a kind—it can be conditionally called *"aerobic"*—to create prerequisites for a transition over to greater training loads and to produce an effect of the endurance "transfer" to the selected forms of sports exercises. The second task, naturally, becomes the more important, the greater is the degree to which the result in the selected sport depends on the athlete's aerobic possibilities.

A definite degree of the development of the "aerobic" endurance is necessary in sports distinguished mainly by the anaerobic power supply of the competitive exercises. However, its effect on the results is very often rather indirect (through indirect functional and adapting links). Thus, the achievements of the sprinter are not correlated with his results in long-distance running. The intensification of aerobic mechanisms in the process of instilling general endurance turns out to be a necessary prerequisite for the perfectioning of aerobic mechanisms. Increased aerobic possibilities allow the sprinter quickly to rehabilitate after anaerobic loads as well. This explains a seeming paradox: very often the athlete trains for running with maximum speed on the basis of relatively slow prolonged running. Or another example. It would be futile to seek a direct link between the achievements of the weightlifter and his showings in cross-country running or in swimming. The absence of such a link does not mean that the weightlifter does not need general aerobic endurance at all: functional possibilities of cardio-vascular, respiratory and other vitally important systems of the organism, which are being insufficiently perfected within the framework of sports speciali-

sation, increase as aerobic endurance develops. The athlete's health, his general work capacity and, therefore, the perspectives of his growth depend on the degree of their development.

Along with the directed increase of the aerobic possibilities of the athlete's organism in the process of his general training it is important to have a sufficient effect on the other endurance factors too. Preferential directiveness of the effects depends on the specifics of specialisation. In general training, for instance, of the gymnast considerable space has to be given to instilling "strength" endurance, while in the general physical training of the player—to instilling endurance in the combined form of exercises of a different character.

When setting the task of instilling the athlete's general endurance no ultimate degree of its development is envisaged. Its expedient indices are planned with due account of the relation of the endurance factors in selected sport, actual level of training reached and the content and volume of loads necessary at the current training stage.

2. **The tasks of instilling endurance in the process of special training.** Detailing them, one must bear in mind the requirements of the athlete's special endurance not only directly during competitions but also during training. These requirements coincide only in part. This becomes obvious if we consider the following circumstances.

For his steady climb up the steps of sporting achievement the athlete must be capable of withstanding during training more considerable and at times intensive specific loads than during competitions. The total load volume in physical, technical and other sections of special training increase regularly from one stage of sporting perfectioning to another. This calls for a corresponding development of "training" endurance which would allow the effective use of mounting loads (suffice it to say that a number of indices of the volume of specific training loads increases in a few years of specialisation by 1,000 per cent and more).

The dynamics of special training endurance indices must be planned proceeding from the notions about the optimal parameters of the specific training loads in every stage of sporting perfectioning and controlled by the parameters actually reached and by the organism's reaction

to test loads. These indices as a general tendency, i. e., in the results of the big training stages, must correlate with the competitive endurance indices. At the same time they do not always coincide in every detail.

It has already been said that competitive endurance in many sports is manifested not in the conditions of a mounting volume of work, but within the framework of standard or nearly standard competitive load volumes (a strictly limited number of runs, attempts, approaches, etc.). In the majority of cyclic sports the duration of a separate competitive exercise steadily diminishes as specific endurance develops (the time of covering the same distance reduces). As the scope and importance of the competitions in which the athlete participates grow, the requirements of psychic factors of his endurance, emotional stability, as well as to the stability of his technical mastery, the ability to maintain and increase the effectiveness of competitive actions grow too. This is what conditions the specifics of competitive endurance, and, therefore, the necessity of setting the special tasks of its instilment.

Thus, while instilling endurance during special training, it is necessary:

firstly, to ensure the development of the special training endurance which would use effectively specific training loads increasing in volume and intensity;

secondly, to work for maximum possible indices of the competitive stability, which would find reflection in a stable work capacity during competitions, in the improvement of results in the course of the competition, or at least in a steady repetition of the results reached earlier (this is confirmed by the minimum degree of lowering of these results under the effect of fatigue and other unfavourable factors, acting in conditions of tense competitions).

The entire aggregate of the tasks discussed is realised in a unity provided that there are consequent factors and forms of manifestation of endurance. In the system of big training cycles (annual and semi-annual) the directiveness of these effects gradually shifts from general endurance to special. At the same time the unity of various aspects of instilling endurance must be ensured at every stage.

Typical kinds of endurance instilling exercises. The general preparatory exercises used for instilling general endurance, in principle, can never be reduced to any one kind of motor activity. Two indications are of essential importance when selecting them:

firstly, the efficiency of the exercises as a means of expanding functional possibilities of the cardio-vascular, respiratory and other vitally important systems of the organism, on which depends the general level of work efficiency (preference must be given to exercises most effective in this respect);

secondly, the ability to use the positive "transfer" effect of endurance is developed with the help of exercises of a general preparatory character, over to the special-preparatory and competitive exercises (preference here should be given to exercises with a greater degree of such "transfer").

Cyclic exercises of moderate, great and variable intensity (cross-country running, skiing, prolonged rowing, cycling, etc.) have become widespread in the practice of general physical training as a means of instilling "aerobic" endurance.

The natural continuity of such exercises, the rhythmical functioning of the main muscle groups, sufficiently full activisation of the systems of oxygen provision to the organism, as well as the relative possibility easily to regulate loads in the course of the exercises—all this preconditions their use as applied to the tasks of the general physical training in most diverse sports. Thanks to relatively insignificant specific features of the vegetative factors of the aerobic endurance the shifts in its development beneficially tell on the work capacity even with essential differences in the forms of exercises (in other words, the range of the endurance "transfer" in this case is rather wide), if they are executed in the similar zone of the physiological power of work or in the related zones. It is not accidental, for instance, that the cross-country running and cycling serve as one of the main means of the general training of skiers and skaters (ski cross-country races play the same role for rowers and rowing for skiers).

However, the higher the intensity of the competitive

actions and the more considerable the role of the specific motor skills, the smaller the possibility of a direct effect of such endurance exercises, manifested in the selected sport. When they are used, say, in speed-strength acyclic sports, indirect prerequisites for the development of endurance are being created. To bring such means of instilling general endurance closer to the specifics of the selected sport, it is expedient in this or that measure to specialise the regime of loads connected with them by analogy with the competitive exercises regime.

For instance, in the physical training of a boxer or a cager preference is given not to uniform but to alternating running with the inclusion of accelerations into it, etc. This makes it possible to model, even if partially, the specifics of the competitive loads in boxing or basketball.

Most other exercises included into the general physical training of an athlete play, in certain conditions, an essential role in instilling endurance. Their efficiency in this respect is ensured not so much by each separate exercise as by the summation of the effects through multiple repetitions, combining various exercises and increasing the motor intensity of the entire training session or of its major parts. To this end coaches resort to special forms and methods of planning training sessions and, first of all, to the forms and methods of the "round training". In such an approach it is expedient to make special composition and the share of various exercises as applied to the specifics of the selected sport (in some cases preference is given, for instance, to exercises with extra weights, in others—to mixed exercises).

Special-preparatory exercises in instilling endurance as in other sections of the athlete's special physical training are selected taking into account the main actions characterising the selected sport.

It is essential that the special-preparatory exercises in the process of instilling endurance are reglamented so as to ensure a more considerable and more directed effect on separate factors, restricting its identification in the selected sport. The total volume of loads connected with the special-preparatory exercises, as a rule, exceeds many times the volume of the competitive loads proper.

The effect of competitive exercises as a means of instilling the athlete's endurance depends on the

duration of the work typical for them. If it is not great, as in a number of speed and strength acyclic sports the exercise assumes the significance of an effective means of instilling the special endurance only by multiple repetition and in decisive dependence on the general regime of the training and competitive loads. In those sports in which competitive exercises due to their considerable duration call for the ultimate requirements to endurance (as in long-distance running) they themselves are very effective means of their instilling.

No matter what competitive exercises are it is impossible to influence without them the entire aggregate of factors of special training of endurance. Therefore, in the entire complex of the means of its instilling, the share of competitive exercises should be sufficiently high and grow further together with the increase of the training record and with the level of the athlete's training.

Additional means. In the last few decades more attention has been given to the search for additional means which would boost the effect of training directed at instilling endurance and would contribute to its development even besides training sessions. This has found its broad expression in the use of the positive effect of the adaption of the organism's functions to unnatural external conditions during periodic training gatherings in the mountains (usually at the foothills at an altitude of 1,800-2,000 metres above sea level).

It is known that staying in the mountains causes with time a number of changes in the organism leading to an increase in its aerobic possibilities.

There is a certain experience in using in the process of instilling endurance such additional factors as increased temperature effect of the external media (training in the hot climate, staying in the pressure chamber, sauna, etc.). Principally, it is conditioned by the conception concerning the heightening of the general (non-specific) resistance of the organism when adapting to any one strong unnatural factor. However, concrete conditions of the expedient use of these factors have been insufficiently determined so far. In combination with great training loads they call for extraordinary requirements which may give a positive effect only when the athlete's state of health is normal and he is sufficiently trained.

3. DETERMINING TRAITS OF THE METHODICS

The methodics of instilling athlete's endurance is subdivided depending on the specifics of the tasks examined and of the means of their realisation. In accordance with the specifics of the different aspects of preparation in the process of training in the competitive conditions there are three main sections.

3. 1. Methodological Peculiarities of the General Preparatory Section of Instilling Endurance

This section focuses on instilling general endurance. The typical traits of the methodics are:

1) combining general preparatory exercises allowing to influence diversely general endurance factors;

2) emphasised gradual increase of training loads and non-ultimate (by the final tendency) degree of their increase;

3) wide range of selecting methods (principal possibility of using various methods yielding similar effect) and their insignificant specialisation.

The ultimate setting in this section is not connected with the achievement of maximum possible endurance indices. General endurance is developed in a degree corresponding to the requirements of the perfectioning in selected sport.

The complex on a whole character of the effects, when instilling general endurance, does not exclude the expedient use of certain methods characterised by the selective directiveness. In particular, methods directed at enhancing the aerobic possibilities of the organism have become widespread. The latter include methods of long-term protracted and continuous exercise with a uniform and alternated load (in practice they are often called "methods of uniform training" and "methods of alternate training"). The volume and the intensity of training work are rated so as to ensure full and continuous activisation of the functions of the cardio-vascular, respiratory and other systems of the organism, which ensure oxygen consumption. The following characteristics correspond to it:

1. The movement speed does not exceed the so-called "critical speed", at which oxygen consumption during work reaches magnitudes commensurable with the ultimately possible oxygen consumption.

2. The duration of an exercise (in a separate session) covers, depending on the specifics of sports specialisation, from dozens of minutes to several hours. This, in principle, calls for more time expenditure than in other training methods. The increase of the work duration is the main tendency of the external load in the methods discussed. They are directed exactly at expanding the possibility of the stable display of a high work capacity with the growing volume of work by gradually prolonging it and thus creating the necessary conditions for perfectioning the metabolism and motor functions and coordinating them directly in the course of an exercise.

The methods of interval training are also used when instilling general endurance (methods of interval exercises with rated load and rest phases). In their different variants they may serve to perfect aerobic, as well as anaerobic endurance mechanisms. True, most of the existing interval exercise methods in cyclic sports are evolved as applied to the tasks of the general physical training of the athlete. In general physical training they occupy a rather insignificant place and are distinguished by less rigid load and rest regimes.

The "round training" methods are the main methods of the complex use of acyclic and combined forms of exercises for instilling endurance and connected with it other physical abilities in the process of the athlete's general training. The exercises selected in accordance with the "symbol" of the round training (i. e., according to the rule of the consequential effect on all the main muscle groups) are executed in series according to the type of the cyclic uninterrupted or interval work. Together with general preparatory exercises special-preparatory exercises are included in the complex of the round training means at different stages of the big training cycle. *(Figures 12, 13)*. This makes it possible to combine the general and special physical training of the athlete.

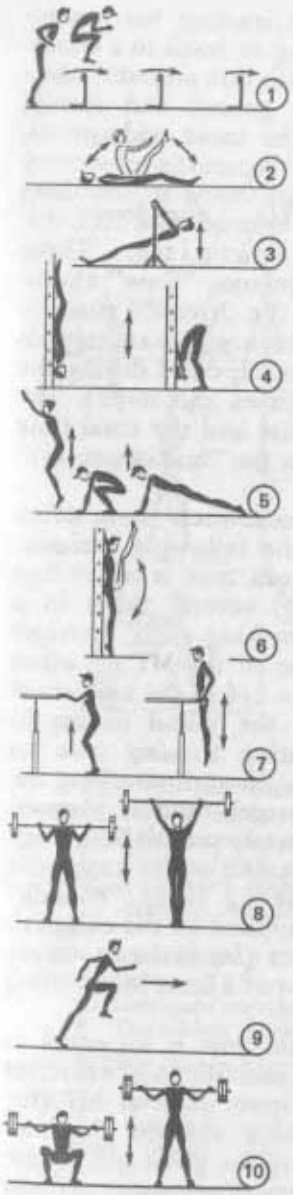

Fig. 12. **An example of the general preparatory set of the round training.**

1. Jumping in a tempo over a low obstacle by pushing off with both feet
2. Transferring in a tempo from lying into sitting "high angle" position and back again
3. Pull-ups in a mixed hang
4. Transferring from a mixed hang with one's back to the wall bars by bending into a bending hang and back again
5. Jumping up in a tempo from a lying support by pushing off with both feet into a hanging position
6. Transferring from a hang into a "high angle" hang on the wall bars
7. Jump mount into support on the horizontal bars—press up—jump off, etc. in a tempo
8. Pressing up the bar (20 per cent of the maximum weight) in a tempo while jumping feet apart—feet together
9. 3x15 m spurts
10. Crouching with the bar (75 per cent of the maximum weight)

Round training in its modern modifications has a number of methodological variants allowing to instil in a complex all the athlete's physical abilities with due account taken of the specific requirements of his general and special endurance. Let's examine some of the most widespread.

In those cases when the intensity of separate preparatory exercises is relatively low, their efficiency in instilling endurance can be enhanced with the help of methods of permanent round training. These methods are characterised by a continuous, "flow" execution of all the exercises included in the "round" (usually 8-12 kinds of exercises) and by the absence of rest intervals between the "rounds", when they are repeated during the current training session (up to 2-3 times and more). The number of repetitions of every exercise and the total time of doing the "rounds" is set based on the "maximum test" indices (MT) and the "target time".

A concrete rating of these load parameters more often than not is carried out by one of the following variants:

First variant. The initial work time is set so that an athlete could cover the "round" several times in a separate session without pauses repeating each exercise approximately in the 1/2-3/4 volume of the MT (in other words within the limits of from 1/2 to 3/4 of the maximum number of repetitions, revealed in the initial testing in the given exercise). An athlete during training tries to reduce this time to the target time without diminishing the total number of repetitions. The target time is planned stage by stage so as in each approximately month-long stage so as to cut down, with due account taken of the increment of indices, the initial time of covering three "rounds" from 18-20 to 12-15 minutes or as applied to the competitive load regime in the selected sport (for instance, target time is set close to the total duration of a bout in wrestling or of rounds in boxing).

Second variant. The initial time is set equal to the target one, while the number of repetitions of exercises in a "round" is initially somewhat lesser than at MT (for instance, 1/4-1/3 of the MT). During sessions the load volume is increased without changing the given work time by increasing the number of repetitions of separate exercises and the number of "rounds" covered. This is expressed in

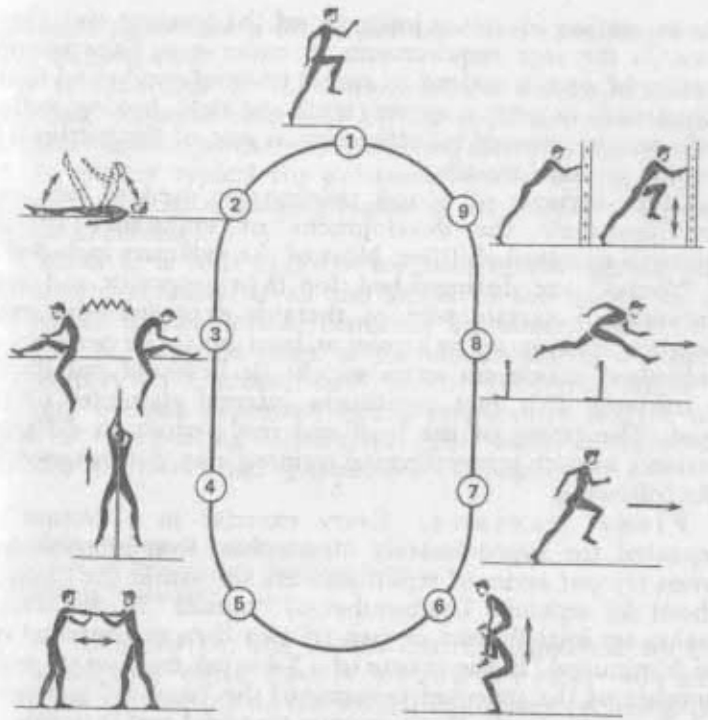

Fig. 13. An example of the special-preparatory set of the round training for the 400 m hurdler.

1. Running on the spot, hips raised high (1 min)
2. From lying prone into the "high angle" sitting position and back again (10 times)
3. Springy bendings in a hurdle sitting position (2 min)
4. Pole climbing without the help of one's feet (5m x 2) or lifting the bar (25 kg x 10)
5. Resistance exercises with a partner (60-90 sec)
6. Crouching with a partner sitting on one's shoulders (10 times)
7. Running while honing technique, submaximum tempo (3x30 m)
8. Running while jumping over two hurdles of an average height with a shortened distance between them (5 times)
9. Imitating "an attack" of the hurdle by the wall with an accented lifting of the hip, alternating (2 min)

the mounting of motor intensity of the sessions and, therefore, in the sum requirements to endurance. Experimental testing of such a variant of round training conducted in the last decade in certain sports (track and field, boxing, volleyball, tennis) showed its efficiency as one of the methods of general physical training.

Other variants of round training are used to influence simultaneously the development of endurance of the strength or speed abilities. Most of the exercises included in a "round" are distinguished for their intensity and brief duration. A certain part of them is executed with extra weights, making up as a rule, at least 50 to 70 per cent of individual maximum extra weight (it is found out during a try-out). This fact conditions interval character of the load. The rating of the load and rest periods in different variants of such interval-round training may, for instance, be the following.

First variant. Every exercise in a "round" is repeated for approximately 30 seconds. Rest intervals between try-out series of repetitions are set within the limits of about 60 seconds. The number of "rounds" in one session makes up initially one or two (if two then rest interval is 3 to 5 minutes). In the course of a 3-4 week training stage the number of the repeated covering of the "rounds" is increased, for instance, to three, leaving standard rest intervals between the "rounds" and between separate exercises. The number of repetitions in each exercise can, too, be increased (without increasing the work time set for it).

Second variant. Most of the exercises in a "round" are performed with an extra load equal to 60-70 per cent of the individual maximum (by 6-10 repetitions in a series, with up to 15 seconds granted for each) serial with the rest interval between the series within 90 seconds. The whole "round" is repeated 2 or 3 times (depending on the total number of exercises) with an intermediate rest of 3 to 5 minutes. As the degree of training grows, the time of each series is reduced, for instance, from 15 to 10 seconds retaining other parameters and rest intervals constant. At the next stage (usually after 3 or 4 weeks), if the aim is to instil strength endurance, the volume of the extra load has to be recalculated (since the athlete's possibilities increase), in other words, to make another try-out and by

its result determine a 60-70 per cent extra weight for the next training stage.

It is expedient in the course of the athlete's training to bring separate elements of the load and rest regime in these variants of the round training closer to the specifics of the regime typical for the competitions in the selected sport (for instance, playing regime in ice hockey or fighting regime in boxing).

Thanks to a wide range of methods round training may be used practically at all the stages of the annual or semi-annual training cycle. Naturally its content and form change. At the first stage of the macrocycle it is general preparatory in character and at the following stages it assumes a more expressed special-preparatory feature and then a "supporting" character. The ratio of different variants of round training changes accordingly.

3. 2. Methodological Peculiarities of the Special-Preparatory Training Section of Instilling Endurance

The methods of this section are distinguished by the fact that they must have a selectively direct effect on the factors of the special endurance on which the level of its manifestation in the selected sport depends directly. Together with it it is expedient to integrally model the forthcoming competitive activity with the approach of the main competitions.

The methodological realisation of these requirements presupposes to combine: methods of the selective effect, including partial modelling of the specifics of competitive activity, methods of the integral-approximate modelling and a number of "transitional" methods.

The methods of selective influencing in the process of instilling special endurance. The methods of this group are distinguished by a relatively narrow effect on this or that factor of special endurance and, therefore, have an incomplete likeness to the selected competitive exercises. The examples given below illustrate how relatively selective directiveness of effect is achieved in a number of such methods.

Current in special physical training of the athletes specialising in cyclic sports are the methods of interval training which influence the aerobic and anaerobic mechanisms of display of endurance in a relatively selective way. Three types of these methods can be singled out.

1. Interval training in the "aerobic" regime. Several varieties of the interval exercise at the laps of the distance, as a rule, shorter than the competitive ones are used so as to enhance the organism's functional possibilities restricting oxygen provision of work in the process of the special physical training of long-distance runners and representatives of similar sports. The load and rest phases are so regulated as to create the most favourable conditions for enhancing work capacity of the cardio-vascular system.

Concrete load and rest parameters in one of such methods—it was evolved initially for middle and long-distance runners by a group of German specialists—are characterised by the following:

a) work intensity is maintained in the zone of the submaximum power (for instance, a qualified long-distance runner covers 400 m laps in 65-70 seconds) so that the load produced a definite oxygen deficiency and thus activised aerobic process during rest intervals (load intensity is rated by HBF, so that it will increase toward each rest interval by approximately up to 160-180 beat/min);

b) duration of a separate work phase, i. e., the time of the continuous effect of the load of the given intensity is set within 1-2 minute limit. On the one hand, this prevents a drop of intensity and, on the other, grants time for the development of aerobic processes in the course of work;

c) rest intervals are maintained within 1 to 2 minutes (the drop of the HBF to 120-140 beat/min may serve as a signal to terminate the rest interval). According to experimental data this interval enables the reception of a desired effect following the immediate consequence of the load. Usually active rest forms are used filling the intervals with jogging or walking;

d) the number of repetitions is determined by the possibility to retain in the course of the exercise the given work parameters without considerably lengthening rest intervals

and without unwanted functional shifts (if, for instance, HBF increases with repetitions to more than 170-180 beat/min, including during rest intervals, which points to the functional shifts towards anaerobic processes, the number of repetitions must be regarded as excessive).

2. Interval training in the anaerobic-glycolitic regime. Of special importance, when instilling special endurance in middle-distance running and in similar sports, is, as it has already been said, the adaptation to unfavourable shifts in the organism's internal media connected with the formation during work of an oxygen deficiency and excessive lactic acid. The search for effective methods for the solution of this problem led to the evolvement of certain specific variants of an interval exercise.

3. Interval training in the "anaerobic-alactatic" regime. This kind of interval exercise is distinguished from the previous one by a higher intensity and brief duration of work phases alternating with relatively prolonged rest.

Thus, according to existing notions, in order to increase directly the power of the anaerobic mechanisms permitting intensive work at the first stage, it is expedient to rate loads and rest in particular in the following way:

a) work intensity close to ultimate (the set out laps are covered with the speed of 90 to 95 per cent of the maximum);

b) the duration of a separate work phase, as a rule, does not exceed 8 or 10 seconds, for instance, running up to 70 metres, skating up to 100 metres; etc. (the increase of work duration is connected with the transfer to other mechanisms of power provision, which is undesirable in this case);

c) rest intervals within each load series comprised of several repetitions, are relatively constant and approximately equal to 2 to 3 minutes, and 7-10 minutes between the series; it is recommended to include in inter-series intervals light movements of small intensity similar in form to the movements in work phases (for instance, walking in intervals between running with accelerations) so as to maintain the work tenor of the neuro-motor centres;

d) the number of repetition loads in one series is set within 3 to 4. At the initial stage the number of repetitions

of the entire series in one session can be approximately the same. As the training level increases the number of series can be increased twice and more times.

The described variants of interval training demand high initial training. Therefore, at the first stage of the preparatory period even qualified athletes use them with considerable restriction.

Another example of the examined methodological approach are methods directed at the improvement of the "strength component" of special endurance. They have already been discussed in connection with the analysis of the methods of instilling the athlete's strength abilities. If an insufficient development of these abilities restricts special endurance, it is expedient to introduce extra weights in separate special-preparatory exercises "on endurance" adding them correspondingly. The extra weight must be rated so that the work duration in the special-preparatory exercise can be brought closer (when it is being performed continuously or with intervals) to the work duration in the competitive exercise.

Certain additional methods in the process of instilling endurance may have a narrower directiveness. Thus to achieve stability in executing coordinatingly complex actions which include rotational movements (in gymnastics, acrobatics, diving, etc.) it is sometimes necessary to use special methods with an effect on the functions of the vestibular apparatus. These methods enable the athlete to adapt to multiple loads and thus ensure stability against sensor fatigue.

All these examples illustrate the possibility to influence certain endurance factors in the process of its instillment. Such methods attract nowadays greater and greater attention and becoming a subject of a profound scientific and practical evolvement. However, the narrower the selective directiveness of the method, the smaller the chance to influence an aggregate of endurance factors integrally. Therefore, the examined group comprises only one of the necessary subsectors of the methods of the athlete's special training.

Transitive* methods with a range of effect which changes stage by stage or have a bordering range of effect. This vast group of methods of instilling special endurance occupies an intermediary position between methods having a relatively narrow selective directiveness and those in which the requirements toward endurance in certain competitive exercises are modelled in an integral way. With the help of methods of this group athletes try to ensure a direct "transfer" of endurance over to competitive exercises through multiple execution of their "parts" being enlarged stage-by-stage (for instance, larger and larger units from the elements of the competitive gymnastic combinations) or through exercises close to the selected sport being rated in load within similar or related intensity zones (for instance, when running laps close to competitive ones).

Concrete variants of such methods in existing sports practice are extremely varied. Partially, this can be explained by the fact that to this day no strict selection has been made of the methods by the notion of their actual effectiveness. But there are quite regular reasons for their diversity. This, firstly, is the multiplicity of factors lying at the basis of the manifestation of endurance and the necessity of influencing them in the training process in different relations so as to use the "transfer" effect more fully. Secondly, the possibility of varying training effects with the help of different methods. This makes it possible to reduce the monotony of training arising as a result of multiple repetitions with which the instilling of endurance is inevitably connected.

In many methods of the examined group the following two methodological approaches are very often met.

1. The use for the purpose of instilling special endurance of the sum effect of discrete loads each of which has a shorter effect than the duration of the execution of a competitive exercise, but in its totality considerably exceeds it. Loads and rest are rated in such an approach as follows:

a) load intensity may be approximately such as at the

* The term "transitive" in this context emphasises that what is meant here are methods with the help of which the transition is effected from the special-preparatory to purely competitive exercises and the "transfer" is ensured from the first to the second.

corresponding phases of the competitive exercise, or somewhat deviate to a greater or lesser side (for instance, running with the speed equal to the mastered average competitive speed or with a deviation from it by 5 to 10 per cent);

b) the duration of a separate work phase (the time of the continuous load effect) is set, first of all, depending on the duration of the competitive exercise and of the mastered special training level; in principle it is necessary that as it develops the duration of training load phases approach more and more the duration of the competitive exercise;

c) rest intervals are restricted within limits facilitating the increase of the functional shifts in the athlete's organism in the course of an exercise but so as not to create a sharp worsening of the movement technique and of its qualitative characteristics;

d) the total amount of training work, as a rule, is brought to a magnitude considerably greater than the competitive one, but this excess can be different (depending on the combination of load parameters). Several concrete examples are given in *Table 16.*

Table 16

Examples of One of the Methodological Approaches of Instilling Special Endurance Connected with the Use of the Effect of the Summation of Discrete Loads

Sports specialisation	Load and rest parameters with the use of a method in a separate training session	Notes
400 m running	10 times by 150 m with the speed of up to 90 per cent of the maximum and 60-sec rest intervals; or 4 times by 300 m with a near ultimate speed	Such loads are observed in high-class runners already at the first stage of the annual training cycle
800 m running	4-10 times by 400 m with a speed of 90-102 per cent of the planned average competitive speed, with 2-5-min rest intervals	One of the widespread variants of rating loads at a pre-competitive stage

Continued

1,500 m running	3-8 times by 800 m with the speed of 96-100 per cent of the average competitive speed, with 3-6-min rest intervals	Ditto
5,000 m running	5 times by 1,000 m with the speed exceeding the mastered average competitive speed, with 4-5-min rest intervals	With the long-distance runner who clocks 5 km, for instance, at 14 min 50 sec, the speed over 1 km may be 2 min 45 sec.
Gymnastics	Recurrent execution of liaison movements consisting of 10-12 elements, partially recreating the competitive combination, 4-6 times in a row, with 4-5-min rest intervals	With high-class gymnasts the number of repetitions may exceed the given several times
Football	Performing game exercises in a "square" (limited space) with a heightened motor intensity (comparing with a usual playing regime), 5 times by 20 min, with 4-5-min rest intervals	Rest intervals are diminished from session to session

The general tendency of increasing the load as the level of special training increases is ensured in such methods either by cutting down rest intervals (from session to session) or by a corresponding change in the parameters of training work—increasing the duration of work phases, the number of repetitions, absolute speed of movements, etc.

One of the main pre-conditions is that the load has not been divided into too small fractions in the initial rating. It is notable that in modern training of the long and middle-distance runners and in similar sports a considerable increase of the share of training work of relatively big laps (600, 800, 1,000, 2,000 metres and more—depending on sports specialisation) came to replace the recent infatuation by the methods of interval exercise performed on sharply reduced laps of the competitive distance (100-400 metres). A number of research works testify to the effectiveness of this tendency.

2. Assisting the development of special endurance through training work in the exercises more prolonged than the competitive exercise (by the duration of the continuous action of the load). Work intensity, while diminishing depending on its duration, must not overstep the limits of the related zone.

The methods, involving such an approach are widespread mainly in cyclic sports. Certain examples are given in *Table 17.*

Table 17

Examples of the Methods of Instilling Special Endurance Connected with Exceeding of the Duration of the Competitive Exercise

Sports specialisation	Load parameters when using one of the methods in a separate training session	Notes
100-200 m running	Covering distances exceeding the competitive ones by 1.5-2 times with a nearly competitive speed, the number of repetitions: 3-4 and more, with 8-15-min rest intervals	Rest intervals are set within limits allowing to maintain the given running pace
800 m running	1,000-1,500 m tempo running with a nearly competitive speed, the number of repetitions is determined depending on the level of training	Ditto
400 m swimming	Covering one-kilometre distance while maintaining competitive pace at its separate laps and somewhat reducing it at others	The length of the laps covered in the competitive pace is gradually increased
5,000 m running	6-8 km alternating running with speed oscillations within approximately 6-7 per cent of the average competitive speed	A more uniform running, all other conditions being equal, facilitates the work

Continued

Gymnastics	Execution of training combinations exceeding competitive combinations in a number of elements and volume of work	A part of the elements of the competitive combination, which has not yet been mastered or coordinationally most difficult ones, are replaced by other elements

The tendency of loads when using such methods at various training stages is characterised at first by exceeding the work volume and then bringing its intensity to the parameters characteristic for competitive exercises.

On the whole the described group of transitive methods is practically more diverse. However, it must be borne in mind that the content of motor actions, as well as the load parameters and rest intervals in the methodics of this group cannot differ greatly from the corresponding characteristics of the competitive exercise as in the general training methods and methods with a narrow selective directiveness.

Methods of integral-approximated modelling. These methods differ from the previous ones by a fuller modelling of the competitive exercises in the training process. Of considerable importance here is an integral (as much as possible) recreation of those specific requirements of the athlete's endurance when he works for a new (planned) sporting result.

The idea of such methods, seemingly, could be realised by an integral repetition of the already mastered competitive exercises with the setting at exceeding the result attained. That is how it is being done in certain cases. For instance, in training sprinters the competitive distance is covered with a maximum speed within the athlete's reach. Researches show, in particular, that this path of instilling special endurance in 400-metre runners is effective when loads and rest are rated within the following limits: two-three-times covering the competitive distance (in one session) with a maximum possible speed and a 7-minute rest between runs.

However, the general volume of the training load in the integral repetition of the competitive exercise with the

setting at a maximum result is rigidly limited (in a number of sports the competitive exercise during a separate session cannot be executed more than once with a given setting). Moreover, in the course of a regular repetition of the competitive exercise its speed and strength and other characteristics may be fixed with a great degree of possibility at a level corresponding to a habitual result. This leads to the formation of a motor stereotype, which does not answer the requirements of a current achievement (speed barrier, etc.). Hence, the necessity for a search of other ways of training which would possibly integrally model the already mastered forms of the competitive activity and at the same time would have adapted the athlete's organism to new regimes of manifestation of endurance. This is a complicated problem. The following examples give a certain notion about practical approaches to its solution in different sports.

1. Minimisation of pauses. In training swimmers and representatives of other cyclic sports a method called "simulator" have been relatively recently evolved in detail (J. Councilman). It is characterised by overcoming during training the competitive distance with a strictly defined speed corresponding to the planned achievement even at this distance and ultimately small rest pauses in the process of covering it. Rest intervals are rated within 5-15-second limits (depending on the length of the distance). They are introduced because without them it is impossible to maintain the necessary speed. The degree of the organism's functional activity in the intervals must not decrease considerably, otherwise a sufficient modelling of the competitive activity will not be achieved (by HBF indices it is not recommended to allow the drop by more than 15 units per 1 minute).

In swimming the distance is usually divided into 3 or 4 laps (if it is not longer than 400 metres) or into 4 or 5 laps (when the distance is 800-1,500 metres). In the first case the first lap is about half the competitive distance, in the second—about a third of it. Thus, if the competitive distance is 100 metres the modelled exercise may look like this:

50 metres (5-second rest) +25 metres (5-second rest)+ 25 metres; total time of covering 100 metres must be equal to

the planned competitive time or somewhat less.

When training for 1,500-metre distance, the laps and rest pauses may make up: 500 metres (15-second rest) +400 metres (10-second rest) +300 metres (10-second rest) +200 metres (5-second rest) +100 metres; the total time of covering laps is limited by the time of planned competitive result.

2. Modelling a full composition of the competitive actions with minimal "replacements". When the athlete has not learned complex motor actions, comprising a complicated competitive exercise (this often happens, for instance, at certain stages of the preparatory training period in gymnastics and similar sports), it is expedient to follow the road of the systematic modelling of given exercises while replacing unmastered elements by those which have already been mastered if in a complex they produce considerable functional load. This allows an integral influencing of the factors of special endurance beforehand, to speed up the process of its development and to arrive at competitions with the necessary degree of specific training.

3. Phase-by-phase intensification of the exercise against the background of an integral execution of a model-target work. One of the ways of the athlete's organism adaptation to a new more complicated regime of the manifestation of endurance in cyclic sports is in the repeated overcoming of the competitive distance while exceeding mastered average competitive speed over the laps the length of which gradually increases.

4. Possible modelling calculated for creating an "endurance reserve". Since in such sports as sports games and encounters the competitive regime of the display of endurance can only be modelled approximately, usually the athlete learns to adapt to various variants of the competitive load, especially to the most intensive of them (if of course such are known). A number of methods of increasing motor intensity and of the general intensification of the training games and bouts are used for the purpose. Together with this, it is expedient to model periodically ultimately expanded volumes of the competitive loads so as to include the situations in which the athlete

may unexpectedly come up against the necessity to continue competition despite extreme fatigue (for instance, in games conducted according to the Olympic system, when additional time is given to find the winner in a draw). Adaptation to such load regimes guarantees the reserve work capacity called for in such situations.

3. 3. The Competitive Section Proper in the Methodics of Instilling Endurance

Even with the most thorough modelling of competitive loads in sports training it is impossible to recreate in full all the specific requirements to endurance such as those operating directly during competitions.

The effect of the competitions as the specific means of instilling competitive endurance depends on the three main variables: 1) the number of competitions (starts) within the framework of this or that training stage; 2) intervals between them; 3) competitive and training load ratio. The role of the competition in the process of instilling the athlete's special endurance increases with the increase of their number, decrease of inter-competitive intervals and mutual supplementing of the competitive and training loads.

The total volume of the competitive load, while regularly increasing together with the increase of the athlete's training level, occupies a more and more considerable place in the total sum of factors for a further development of the training level. The number of competitions conducted not only in the competitive but also in the preparatory period of the annual and semi-annual cycles is growing in modern sports practice.

Maximum interval between the two immediate competitions which would allow at least a partial cumulation of their effect, beneficial for the development of endurance (without additional training loads), in many cases is within one week. It means that with the increase of the given interval the training effect of the competitions will vanish, and with the decrease—grow. However, it does not follow that the smallest interval will always be the best (optimal).

In this respect the following experiment is indicative.

Four variants of the series competitive loads have been compared with the only difference that the intervals between them were 2, 3, 4 and 7 days. The experimental starts of the 4-kilometre cycling race type were repeated in each variant (with one of the given intervals) until a tendency was found of the stabilisation or deterioration of the given index of the competitive results—the time expended on the execution of the competitive exercise *(Fig. 14)*. In the intervals between the competitive loads all the participants in the experiment did only light rehabilitating exercises. As is seen from the diagram in *Fig. 14* all the compared variants of the series of competitive loads were accompanied during a certain period by the improvement of the achievements, but the degree of the improvement turned out to be different: the greatest—with the inter-competitive intervals of 3 days, the smallest—with the intervals of 7 days. This points to a considerable training importance of the series competitions alternated with optimal rest intervals. But it follows from the same data that the competitive loads alone, even when given three times a week, cannot serve as a sufficient factor of enhancing the level of training (in the given cases a tendency appeared of a drop in the work capacity already at the third week).

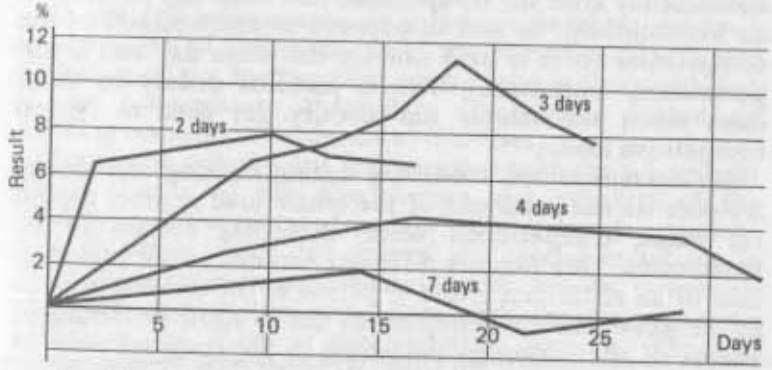

Fig. 14. **Dynamics of the achievements in the conditions of the series starts with different rest intervals (explanations in the text).**

Naturally, not all the sports allow the use of such an intensive series of competitive loads. The specifics of

such sports as combined events, boxing and marathons impose most considerable restrictions. However, a possibility can always be found of increasing somehow the volume of competitive practice or to enhance its role in instilling competitive endurance. The following methods can be of considerable importance here:

1) supplementing the performances according to the full competitive programme (for instance, according to the programme of decathlon or combined events in gymnastics) by competitions according to a partial programme (in certain events of the combined events, only according to compulsory or only according to free programme);

2) supplementing performances in the main competitive exercise (or exercises) by the competitions in the related sports exercises close in character (for instance, covering distances in running related to the main competitive distance);

3) participation in the preparatory competitions against the background of the preceding hightened training loads (due to a cumulative load effect this makes the athlete mobilise his work capacity to the utmost);

4) supplementing competitive load by the training one immediately after the competition (the same day or without an interruption), as well as between separate phases of the competition (if it is held not on the same day and is not particularly important). This is justified mainly in those cases when the athlete has already got used to typical competitive loads;

5) interconnected modelling during training and during try-outs of the parts and of the entire load regime, typical for major competitions while exceeding certain of its parameters. This permits different variants—from introduction of an additional round or period in the training bout or in the game with the requirement not to allow worsening of results of the action to modelling in the compact form of the entire regime of loads of the multi-phase competition, including a many-day one.

All this in aggregate with a reasonably organised practice of regular participation in official competitions ensures a proper efficiency of the effect aimed at the development of the athlete's special competitive endurance.

3. 4 Combination of Various Sections of Instilling Endurance

The expounded sections of instilling endurance at various stages of the training process are in different correlations. The main logical line of combining them in big training cycles is a consistent shift of their "training dominant" (preferential directioning of the training effects) from the general preparatory section over to the special-preparatory one and then over to the competitive one.

The general preparatory section, since it ensures a diversified development of work efficiency, including "training" endurance, and expands prerequisites of the effective use of greater loads, occupies an especially significant place at the first stages of the athlete's training of many years and at the beginning of each annual or semi-annual training cycle.

The increase of the general level of the organism's functional abilities forms a foundation for the following massive use of the means and methods directed at developing special endurance. The latter is relatively insignificant at the beginning of the cycle. From a number of special-preparatory methods those are mainly used in which the specifics of the competitive regimes of the manifestation of endurance are recreated only partially.

At the following stages—as main competitions get nearer—the share of the methods of the integral-approximated modelling of the forthcoming competitive activity and then of the competitions themselves (as specific factors of instilling competitive endurance) increases.

It must be pointed out that together with the subsequent partial change of the directiveness and structure of the given process the unity of various components is preserved in it. In other words, the general and special endurance in the training cycles is instilled not strictly in turn, but simultaneously and at the same time with the stage-by-stage change of the share of corresponding sections. The rule "from general endurance—to special" widespread in sports literature must be understood exactly in this sense. If this rule is followed strictly, the development of the special endurance may be artificially retarded and unjustified deviations from sports specialisation produced. An opposite extreme must also be avoided, i. e., forced instillment of

special endurance without ensuring to a certain measure the expansion of the functional possibilities of the organism.

A complicated character of the interaction of different endurance factors demands a specially thorough control of the directiveness of the functional shifts in every section of instilling endurance. Due account has to be taken in particular of the dynamics of the aerobic and anaerobic capabilities of the organism together with the dynamics of the corresponding components of the training load, while taking due account of the fact that at different stages of training these shifts may take one or more directions.

On the whole the problem of the optimal correlations in instilling endurance in an athlete is complicated. In its turn it is only a part of a broader problem of rationally planning the training process, on the basis of which an expedient combination of all the components of this content within the framework of the small, average and big training cycles is attained.

PART THREE

THE STRUCTURE OF SPORTS TRAINING

Chapter Nine

Fundamentals of the Structure of Training and Its Initial Links

1. THE STRUCTURE OF THE TRAINING PROCESS AS THE BASIS OF ITS INTEGRAL ORDER

When analysing the main sections of the content of the sports training, it was often emphasised that they are inseparable in practice. Without understanding how they are bound up into a single whole it is impossible to understand the essence of the training process and to master the methods of its practical structuring and planning. *The integrity of the training process is ensured on the basis of a definite structure which is a relatively stable order of uniting its components (parts, aspects and links), their regular correlation with each other and their general consequent character.*

If we concretise this definition with the help of the notions discussed earlier, we can say that the structure of the training session is characterised in particular by the following: a rational order of the interaction of various aspects of the content of an athlete's training (components of the general and special physical training, physical and technical training, etc.); the necessary correlations of parameters of the training loads (quantitative characteristics of the volume and intensity of training work), as well as by the training and competitive loads; a definite sequence of different links of the training process (separate sessions and their parts, stages, periods and cycles) which are the phases or stages of the given process, expressing regular changes in time.

Since sports training is characterised in each of its sepa-

rate phases by certain stable correlations and at the same time is a continuously changing process, when analysing the structure, it is important to have in mind two aspects: "static" and "dynamic". When examining the training structure in its static aspect, its separate links (phases, stages, cycles) are singled out and attention is drawn to the correlation of the components of the training session typical of the given link. When, for instance, it is said that the ratio of the general and special training is one to two or that the strength load share in a microcycle must be so and so per cent from the general total load volume, actually what is meant here is the training structure in the static aspect. When examining it in the dynamic aspect, attention is concentrated on the training process dynamics—on the regularities of its change as the phases change (or in anyone of its phases). Thus, when speaking about the necessary sequence of alternating training sessions and rest in microcycles, about the distribution of training loads in time, sequence of the training process stages and periods, etc., what is actually meant is the structure of the training process in the dynamic (time) aspect. Combination of these aspects taken as a unity, enables us to comprehend a real picture of planning a training session.

Contemporary outlook on the fundamentals of structuring a training session is connected in this or that way with the recognition of the three levels in its structure:

1) **microstructure** level—the structure of a separate training session and of small cycles (microcycles) covering several sessions;

2) **mesostructure** level—the structure of average training cycles (mesocycles) including a relatively finalised number of microcycles;

3) **macrostructure** level—the structure of big training cycles (macrocycles) of the type of semi-annual, annual and those of many years.

The training structure on the whole is preconditioned by the correlation of the external and internal factors of the development of the training level, their regular links and interactions. The problems of the optimal structuring of a training session lie in the fact that, forms most fully answering the aims set and the conditions of their realisation

must be lent to it, based on the regularities of the structure of the training process.

2. THE STRUCTURE OF SMALL TRAINING CYCLES (MICROCYCLES)

2. 1. Training Sessions as Elements of the Structure of Microcycles

The structure of a separate training session is an initial integral link, a multitude of which comprises the entire training process. Training assignments, just as other forms of engaging in sport, have a number of common traits, typical for the structure of any rationally organised engagement in physical exercises. There are three parts in every separate session: preparatory ("warm-up"), main and concluding. The general methodological rules of their structuring also apply to sport.

The structure of the sports training sessions is aimed at achieving a maximum training effect in the selected sport. Although the content of the sessions may have, depending on the training periods and on other circumstances a complex as well as narrow character, multiplicity of the tasks solved is not characteristic for most of the sessions. The difficulty of the tasks of sporting perfectioning makes it binding to concentrate efforts at a relatively small range of assignments. The entire aggregate of tasks is solved by increasing the total number of training sessions (even to several in the course of one day).

Frequently, only one kind of the motor activity—for instance cross-country running—may constitute the main content of the training session. The preparatory and the final part of the session in this case may also include primarily "running" material. The homogeneity of the content of the session lends to its parts an especial monolithic feature: preparatory and final parts assume a strikingly expressed service function in respect to the main part and are organically subordinated to it by content and structure, as well as in duration.

When the content of the session is non-homogeneous, its structure becomes more complicated: more complicated is the order of combination of various exercises, alternation of load and rest intervals, etc. The comprehensive nature of the sessions makes the guidance of the training effect more

difficult. The experimental comparison of the results of the training sessions with a relatively homogeneous content and of the sessions with a diversified goals showed that the former are more effective in a number of respects (if their methods are not monotonous). But complex sessions have the advantages of their own (possibility of using the effect of the positive consequence of various exercises, the effect of active rest, non-monotony, etc.) In certain situations they are the necessary elements of the training structure, especially at the first stage of the preparatory training period.

The dependence of the structure of the sessions on sports specialisation is quite obvious. The structure of the training sessions in combined events, as a rule, is more complex than when specialising in a sport with a limited number of competitive exercises. Correlations of the parts of the training session, the duration of the load and rest intervals and other moments of its structure differ considerably. Thus, the duration of a separate session of those specialising in acyclic sports requiring speed and strength abilities in most cases is shorter than with the representatives of the long-distance sports (with road cyclists it reaches several hours).

As an element of training microcycles each session is connected with the previous and the following sessions. Their content and structure depend on the general number of sessions, the total volume of loads, peculiarities of the load and rest regime in the microcycle. The links between the sessions and their dependence on the general load and rest regime in a microcycle are particularly essential in everyday training with recurrent sessions. This becomes typical for training high-class athletes. It presupposes a precise subdivision of the sessions into m a i n a n d e x t r a .

The main tasks expressing the general trend of the athlete's training at various stages of the training process are resolved above all, at the main sessions. Being notable for an increased load volume and high motor requirements, the main training sessions are accompanied, as a rule, by the prolonged rehabilitating processes (up to 48-60 hours and more). Extra sessions are conducted against this background. The following functions may be characteristic of

them: a) intensification of the immediate effect of the main session by combining it with the effect of the extra sessions, thus producing a powerful "supercompensation"; b) assisting rehabilitation (extra rehabilitating sessions); c) solving partial tasks, which are not essential at the given training stage (for instance, maintaining various components of the general physical preparedness at the special-preparatory stage, prevention of the flexibility regress during concentrated strength training). Their structure also changes within wide limits.

2.2 The Indicators of the Microcycles and Their Conditionality

General traits of the microcycles. As it has already been shown, separate training sessions assume the importance of the interconnected links of the integral process, first and foremost, in the composition of the microcycles, which are the first relatively finalised, recurrent fragments of the training process stages. Frequently, but not always, microcycles are one week long (week microcycles).

A separate microcycle includes at least two phases: s t i m u l a t i n g (cumulative) which is connected with this or that degree of fatigue and r e h a b i l i t a t i n g (rehabilitating session or full rest). The minimum duration of a microcycle is two days (the ratio of the first and second phases is one to one). Microcycles of this duration are used relatively rarely, because their framework is too narrow for a wide range of tasks of sports perfectioning, and as the training level increases they begin to restrict the impact of training sessions. Usually these phases are repeated in the structure of the microcycle and their main rehabilitating phase coincides with its end. A weekly cycle may include, for instance, two cumulative phases (each of two or three sessions), separated by the rehabilitating session and finalised in a day of active rest.

It is evident from this example that the rehabilitating phase does not always indicate that the microcycle is over (it may also be inside it). Another indication is the logical completion of a certain sequence of the session. Thus, in the preparatory period microcycles are so constructed as to

ensure a consequent selective effect on all the main physical abilities determining achievements in the selected sport. The sequence of the sessions depends of the interaction of the effects of microcycles. For instance, it is expedient to conduct sessions mainly developing speed abilities not after but before the sessions with great volume of loads aimed at the development of endurance or intersperse them with rehabilitating sessions. A regular recurrence of the optimal sequence of the sessions with different aims comprises one of the fundamentals of the training microcycles.

Factors and conditions influencing the structure of microcycles. Among many factors and conditions influencing the structure and duration of training microcycles the following are most significant:

1) the general regime of the athlete's life (including study and work regimes) and the work level conditioned by it. It is not accidental that the training microcycles very often, especially in mass sports practice, are tied to the calendar week. This does not always fully correspond to the optimum structure of the training process, but dovetails the training regime with the main points of the general regime of life and work;

2) the content, number of sessions and the total load volume in a microcycle. These factors are conditioned, first of all, by the specifics of sports specialisation and the level of the athlete's training. When training is conducted daily (in cases of well-trained athletes), the specifics of the structure of the microcycles depending on sports specialisation, are expressed, in particular, in the different frequency of the main sessions and different sequence in directiveness. When specialising in long-distance running or cycling, the main sessions are conducted in conditions of incomplete rehabilitation more often than in the speed-strength sports. In the latter the aims of the sessions are changed with due account of non-simultaneous rehabilitation with different loads;

3) individual reactions to training loads and biorhythmic factors. Although individual specifics of the adaptation of the athlete's organism in the process of training have not been sufficiently studied, there is no doubt that the volume of the rahabilitating intervals between sessions and, consequently, load and rest regime in microcycles and other

features of their structure essentially depend on them. Obviously biorhythmic vacillations of the functional state of the organism with a period close to one week have a definite effect on the structure of the microcycles. Research (although not very extensive so far) testifies that when the phases of the training cycles correspond to the phases of the given biorhythms it raises the training level;

4) the place of microcycles in the general system of planning the training. The structure of the microcycles regularly changes in details as the training process unfolds, depending on the change of its stages and within its separate stages. In other words, the structure of microcycles depends on their place in bigger structures of the training process—average and big training cycles. The order of the forthcoming competition, frequency of starts and the volume of intervals between them have a special effect on the structure of microcycles at the stages of the direct precompetitive training.

It follows that there cannot be a universal structure of microcycles equally useful for all cases. It invariably changes depending on the training content as the level of training develops, as well as under the effect of the external circumstances. Introducing expedient changes into the content and structure of the microcycles (i. e., changing the complexes of exercises, the number of the main and additional sessions, their sequence, load and rest regimes, the dynamics of the load volume and intensity, etc.) the coach and the athlete exclude the external interferences and ensure a general progressive tendency of the training process.

Types of microcycles. The athlete's training and competitive activity is organised in the form of microcycles of various types. Training and competitive microcycles proper are the chief of them. Microcycles which bring the athlete up to competition ("introductory" microcycles) and the rehabilitating ones are regarded as additional.

Training microcycles proper are subdivided into general preparatory and special-preparatory according to the indicator of their preferential directiveness. The first are the main type of the microcycles at the beginning of the preparatory period and at some of the stages of the big training cycle connected with the increase of the share in the general physical training; the second serve as the

main type of microcycles in the pre-competitive training and are one of the main in a number of other stages of the big training cycle. Microcycles of both types have variations. Thus, some of them may be called "ordinary" which are notable for a uniform increase of the training loads, their considerable volume, but uncertain level of intensity in most of the separate sessions (this is characteristic mainly for general training microcycles and some special-preparatory microcycles). For others—"shock"—microcycles their total intensity attained, in particular, by concentrating sessions in time (this is typical mainly for the special-preparatory microcycles) is characteristic alongside the increased load volume.

"Introductory" microcycles are planned according to the rules of directly bringing the athlete to the competition. Modelled in them are a number of elements of the regime and programme for the forthcoming competitions (distribution of load and rest in accordance with the sequence of the days of performance and intervals between them, reproduction of the order of performance during the day, etc.). The concrete content and structure of such microcycles are preconditioned by the specifics of the athlete's pre-start condition, consequences of previous training and by the specifics of the chosen method of bringing the athlete up to this condition (with certain methods of bringing the athlete to the competition) the last pre-competitive microcycle may have the traits of a contrast relative to the competitive microcycle.

Competitive microcycles have their basic regime of competitions set by the official rules and order of the concrete competition. As well as the days of the competition, these microcycles include the phase of the prompt "tuning-up" for the day, preceding the competition and inter-start phases (when competitions are conducted not in one day, as is often the case in major competitions in most sports). The organisation of the athlete's behaviour in competitive microcycles is aimed at ensuring optimum condition of readiness for starts, assisting rehabilitation and "superrehabilitation" of work capacity in the process of competition, guaranteeing full rehabilitation of the athlete's abilities in the final starts.

Rehabilitating microcycles usually fol-

low tough competitions or are introduced at the end of the series of training microcycles (often immediately after "shock" microcycles). They are characterised by a relatively diminished volume of training effects, an increased number of days of active rest, a contrasting change of the composition of exercises and the external conditions of the sessions. All this is directed at the optimisation of rehabilitating process. Considering that the microcycles of this type are distinguished for a relatively low level of load intensity, they are called "unloading".

As is evident, the types of microcycles in sports training are quite varied. It can be easily imagined that all the possible variants of their combinations in the average training cycles are even more varied.

3. AVERAGE TRAINING CYCLES (MESOCYCLES)

The foundations of the structure of the average cycles and their conditionality. Various microcycles serve as building blocks from which average training cycles (mesocycles) are built. One mesocycle consists as a minimum of two microcycles. In the existing practice of planning, training average cycles consist more often than not of 3 to 6 small cycles and have a common duration close to monthly. The "set" of microcycles changes depending on the logics of the unfolding of the training process and concrete specifics of its stages.

Recurrent reproduction of a certain aggregate of small cycles (in one and the same sequence) or replacement of the given aggregate of small cycles by some other their aggregate is an external indicator of average cycles. If, for instance, microcycles (MC) follow each other in the following order: ("ordinary"→"ordinary"→"shock"→"rehabilitating") → ("ordinary" → "ordinary" → "shock" → "rehabilitating"), the average cycle of the same type (it is singled out by round brackets) is reproduced repeatedly here. The replacement of one row of microcycles by the other points to the change of the types of middle cycles. For instance: ("ordinary"→ "ordinary" → "shock" → "rehabilitating") → ("introductory"→"competitive"→ "rehabilitating").

In this example, as in the first one, there are two middle

cycles, but of a different type.

The middle training cycles are conditioned partially by the factors about which we spoke when characterising microcycle's structure (2. 2). However, the regularities of the construction of training within the framework of the middle cycles cannot be explained only by the regularities operating within the limits of its microstructure. Mesocycles are the necessary form of constructing training, first of all, because they allow the expedient control of the cumulative (sum) training effect of each series of microcycles, ensuring a high tempo of development of the training level and preventing violations of the adaptive processes which may result from the chronic "piling up" of the training load effect. As it has already been shown, the adaptive changes at different levels of the morpho-functional organisation occur simultaneously (heterochronous) and, therefore, in this or that measure lag behind in relation to the dynamics of the training loads. To avoid dangerous discrepancies (expressed in so-called "overtraining") the tendency of loads in the microcycle series has to be changed in a certain way: not only to raise the level of training requirements, but relatively to lower it in certain microcycles. Hence, average "waves" appear in the load dynamics, which make up one of the structural bases of the training mesocycles.

Probably, near-monthly biocycles influence the duration of the average cycles and the character of the load distribution in them, in particular so-called "physical" (23 days long), each of which having two phases, connected with the increase or a relative drop of some functional manifestations.

This surmise has not been strictly corroborated as yet. However, the very fact of the existence of certain monthly biocycles (for instance, menstrual) is doubtless. There is data testifying to the wisdom of taking into account a possible effect of the biorhythms when planning average training cycles. Biorhythmic factors do not, of course, presuppose a concrete result of the athlete's activity, because they themselves are being influenced by training loads and the external conditions of the sporting activity.

Just as microcycles, average cycles change in the training process. Their structure depends on the specifics of the

content of the athlete's training in different periods of the big training cycles, the system of competitions, intervals between them, cumulation regularities of the training and competitive loads, rehabilitating conditions and on a number of other circumstances. This finds its expression in average cycle variations.

Average cycle types. Among the variants of mesocycles some of them remain over entire periods of the training process, others are typical only for certain stages or substages. To the first belong "base" and "competitive" mesocycles, to the second—"involving", "control-preparatory", "pre-competitive", "rehabilitating-preparatory" and some others.

I n v o l v i n g m e s o c y c l e s. With this cycle usually begins the preparatory period of the big training cycle. These cycles often include only 2 to 3 ordinary microcycles, rounded up by a rehabilitating microcycle. The general level of load intensity in the involving mesocycle is lower than in the main mesocycles of the preparatory period, but the load volume may be quite considerable (especially when specialising in long-distance running or cycling). The composition of the training means is characterised by the heightened share of the general preparatory exercises.

In certain cases the involving mesocycle is repeated (gradually increasing the load level). This depends on the adaptive abilities of the athlete's organism, specifics of sports specialisation, character of the preceding training, as well as on the attendant circumstances (forced intervals in training, illnesses, etc.).

B a s e m e s o c y c l e s. These are the main type of mesocycles of the preparatory training period. It is exactly in them that the main training requirements leading to an increase of the organism's functional abilities are realised, just as the main training work of forming the new and transforming the sports motor skills which were mastered earlier.

Mesocycles of this type are represented at different training stages in several variants. Thus, in their primary content they can be general preparatory and special-preparatory and in the effect of the primary influence on the dynamics of the training degree—"d e v e l o p i n g" and

"stabilising".* The base cycles of the "developing" character play the primary role when an athlete passes over to a new level of work capacity and is distinguished in this connection by considerable parameters of training loads (total volume of loads in the mesocycles that high-class athletes may reach, for instance, with long-distance runners 600-800 kilometres and more, with swimmers—200-300 kilometres and more and with weightlifters—150-250 tons and more—in specialised exercises alone). Such cycles alternate with the stabilising cycles characteristic of which is a temporary cessation of the increase of loads at the level reached. This makes adaptation easier to earlier unusual training requirements and facilitates the completion and fixation of the chronic adaptive restructurings.

Training microcycles proper are the main elements of the base average cycles in all the variants but in different combinations. In some variants the base cycle is made up only of the different kinds of training microcycles proper, while in others a rehabilitating microcycle is introduced additionally. For instance, the developing average cycle may include the following microcycles: "ordinary"→"ordinary"→"shock"→"rehabilitating" or: "shock"→"ordinary"→"shock"→"rehabilitating".

The stabilising average cycle, when it is introduced, between developing cycles, may comprise, for instance, only two ordinary microcycles. There are also other variants of base mesocycles. Their number depends, above all, on the general regularities of planning training in the preparatory period, individual peculiarities of the development of the training level and the time the athlete has at his disposal for preparing for important competitions.

Control-preparatory mesocycle. The given type of average cycles is a transitory form between the base and competitive mesocycles. The training work proper is combined with the participation in a series of competitions which are mainly control-training in importance and are subordinated to the tasks of preparing for major competitions. One control-preparatory mesocycle may comprise,

* Some of the terms used to denote the variants of the average and small cycles are not yet generally accepted. They must be regarded as a work terminology which will be unified in due time.

for instance, two training microcycles and two microcycles of the competitive type (without special bringing to the starts). Depending on the general course of the development of the training level and the shortcomings exposed by control starts, the content of the training sessions assumes different directiveness. This also refers to the tendency of the training loads. In some cases the intensification of the special-preparatory exercises (if the development of the specific training level has to be stimulated additionally) becomes the main tendency, in others—stabilisation or even lowering of the general load level (when symptoms of the chronic fatigue come to the fore). When control starts reveal serious technical or tactical flaws, their elimination becomes the determining line of the session in the given, as well as in the current, mesocycle of the basic or pre-competitive type.

Pre-competitive mesocycle. Pre-competitive mesocycle is typical of the immediate preparation stage for the main competition (or one of the main competitions) as a special form of planning a training session. The specifics of the mesocycle of this type are determined by the fact that the regime of the forthcoming competition has to be modelled with the utmost approximation and adaptation to its concrete conditions ensured along with the creation of optimum conditions for a full realisation of the athlete's abilities in the decisive starts. If the forthcoming competition is specially important and is being conducted in extraordinary external conditions, (for instance, climatic) the athlete prepares especially for it frequently not in one but in two or more average cycles which make up in such cases an entire training stage. In other cases special pre-competitive training is planned within the framework of one mesocycle or is limited by one introductory microcycle, which is included in the competitive mesocycle (if the competition is not very important and is not distinguished by the specific conditions of holding it).

Competitive mesocycles. This is the main type of the average training cycles in the period of main competitions when there are several of them and they follow one another with intervals, co-measured with the duration of average cycles. In the simplest cases the mesocycle of this type includes one introductory and one competitive cycle or introductory, competitive and rehabilitating

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microcycles. Depending on the number and order of distribution of starts the competitive mesocycle changes. It may also have in its composition microcycles which include "introductory" competitions. Besides the system of competitions the regularities of maintaining a good sporting form have a decisive effect on the frequency of their repetition and the order of sequence with mesocycles.

Rehabilitating-preparatory and rehabilitating-maintaining mesocycles. The first as to the number of its indices is similar to a base mesocycle, but includes in it an increased number of rehabilitating microcycles, for instance: "rehabilitating"→"ordinary"→"ordinary"→"rehabilitating".

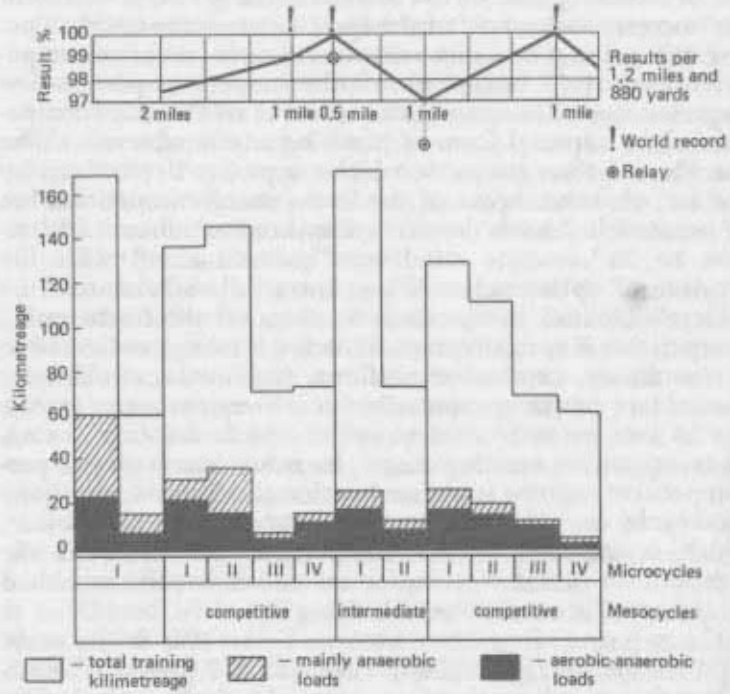

Fig. 15. **An example of the competitive mesocycles of a complicated structure. Here they include two introductory and two competitive microcycles each. Shown also is an intermediary rehabilitating-preparatory mesocycle (J. Ryun training for setting 880 yards and 1 mile world records).**

The second one is characterised by a "softer" training regime and by a wider use of the "transfer" effect in the shape of a partial replacement of the form, content and conditions of the training session. Mesocycles of this type are used when the competitive period is lengthy in duration, in which they fitted in between the series of difficult competitions (hence another name of the given mesocycles—"intermediary"). They are a typical kind of average cycles in the transitory training period. While ensuring a relative "unloading" in the form of active rest, mesocycles of this type help the athlete rehabilitate after chronic loads and thus exclude the cumulative effect growing into overtraining. Besides, they ensure the retention of the acquired training level and stimulate its development (in a measure in which training microcycles proper are represented here).

The enumerated average cycles form, in certain combinations, the stages and periods of the training process. In other words, they serve as "building blocs" in the structure of big training cycles. Naturally, a question must arise: what rules determine the expedient order of alternation of mesocycles of various types and the same type; what is the logics of their combination and the necessary general sequence? The knowledge of the regularities of the periodisation of sports training provides the answer to it.

Chapter Ten

Annual and Semi-Annual Training Cycles

1. FUNDAMENTALS OF THE PERIODISATION OF THE BIG TRAINING CYCLES

As a rule there are three periods in the big training cycle (annual and semi-annual): preparatory (or to be more exact, the period of fundamental training), competitive (the period of main competitions) and transitional. Initially it was the calendar of sports competitions and seasonal and climatic conditions (change of the external conditions of training sessions in the natural cycle of the time of the year) that were thought to be responsible for the periodic changes of the training process. A consequent thorough analysis has shown that neither these nor similar external factors, no

matter how important they were, determined the essence of sports training and they alone were insufficient for explaining the fundamentals of its periodisation. According to the concept evolved by the Soviet experts, the reasons for the cyclic alternation of training periods must be attributed, first of all, to the regularities of the development of sporting form.

1. 1. Regularities of the Development of Sporting Form as a Natural Beginning of the Training Periodisation

"Sporting form" and its criteria. The notion of sporting form was given a brief definition in the introduction and characterised as a *state of optimum (best) readiness of the athlete for achieving sporting result which is acquired under definite conditions in each big training cycle* (annual or semi-annual). It is characterised by a complex of physiological, medical-control and psychological indices. On the whole, sporting form is a harmonious unity of all the aspects (components) of the athlete's optimum readiness: physical, psychic, technical, and tactical. The presence of all these components alone gives ground to say that the athlete is in good form. No matter how high, for instance, the level of his physical preparedness is, no matter how perfect his technical and tactical skills are, he cannot demonstrate a high result in important competitions if he lacks an adequate psychological setting, will readiness and emotional stability. Sporting form is characterised not only by the presence of various components but also by their harmonious correlation, corresponding to a definite level of sporting results.

The notion optimum readiness, as applied to the entire process of sporting perfectioning, is also essential: it is true only for each of the given cycles of the development of sporting form. As the athlete moves up the ladder of his sporting results, this optimum changes—sporting form becomes different as to the qualitative and quantitative indices.

The main integral indices of sporting form are the results demonstrated in real sports competitions. All the aspects of the athlete's readiness for sporting achievement are reflected only in his sports results. However, there is enough ground to judge sporting form by

sporting results only when they are demonstrated with a definite frequency in comparable conditions and are evaluated in objective indices (measures). In this connection the selection of the quantitative criteria of sporting form is of great theoretical and practical importance. Research permits a singling out of two groups of criteria of this kind: "progressive criteria" and "stability criteria".

"Progressive criteria" characterise sporting form by the degree of the increment and absolute level of the athlete's achievement in the given big training cycle. The indices here, in particular, may be:

a) the volume of difference between the best individual result in the previous big training cycle (annual and semi-annual) and the examined result in the current training cycle: the more the latter exceeds the result of the previous cycle, the greater the possibility that the athlete is in good sporting form and vice versa. The athlete's training record and the degree of the nearness of his result to the absolute record (world or some other) are to be taken into consideration. Athletes with an extensive training record (7 to 10 years) and an outstanding personal record very often may have no increment in their achievements in one big training cycle. The fact of the repetition of a personal record, or a result close to this level (within 1 to 3 per cent depending on the specifics of the sport) may be taken as a conditional index of the sporting form;

b) the volume of the difference between the examined result of the control competition and the results of the first starts in the given big training cycle: the more the athlete exceeds his results in the first starts the greater the possibility that the athlete approaches the condition of his sporting form.

The combination of the following indices may serve as stability criteria:

a) the number of results the athlete demonstrates at the competitions within the rated zone of sporting form. The lower limit of this zone of the high-class athlete must not greatly deviate from the level of his best result. For instance, in cyclic sports (excluding long-distance) the result comprising at least 98-98.5 per cent of the personal record may be regarded as the conditional limit

of the sporting form zone. In other words, if the athlete, despite full mobilisation of his forces and absence of unusual interferences, demonstrates results below the given level, this shows that he lacks good sporting form.

If the results of the athlete's performance in quite frequent competitions are higher than the given level, there is every ground to assume that the athlete retains his good form. The data on hand shows that high-class athletes manage to show within the given zone up to one-third of all the results in the course of the annual training cycle;

b) the average time interval between the results in the rated zone of sporting form (i. e., the frequency of demonstration of the sporting results, the value of which is not below the result accepted as the lower limit of the given zone). The more the athlete shows such results during the big training cycle, the shorter the time interval between them, the greater the sporting form stability;

c) the total duration of the period during which sporting results with systematic participation in competitions do not drop lower than the level accepted as the limit of the sporting form zone.

These criteria are not very informative if an athlete competes only once a month. But they provide important information on the stability of the sporting form if competitions are arranged weekly, which nowadays is typical of the competition schedule of top echelon athletes in many sports.

Since the criteria of the progress and the stability of sporting form characterise it in different relations, the links between them are not uniform. The total number of performances in the competitions during the big training cycle is usually positively linked with the magnitude of the increment and absolute level of the achievements. The number of particularly important competitions often reduces these indices. It would not be superfluous to repeat that the state of sporting form may be determined with full confidence only if the general criteria are used which evaluate separate aspects of the athlete's preparedness along with specialised methods of the functional control (medical, biological and psychological).

Phases of the development of sporting form. The aggregate of research and practical data about sporting form amassed so far testifies to the fact that the process of its

development is phasic in character—undergoes a consecutive change of three phases: acquiring, retention (relative stabilisation) and temporary loss of the sporting form *(Fig. 16)*.

First phase is the phase of the formation and bettering of the prerequisites on the basis of which sporting form appears. It is consummated by the formation of an integral system of components. At this stage, speaking figuratively, building material is accumulated from which the entire building of sporting form will be erected, and its foundation is laid and consolidated. In other words, the increase of the general level of the organism's functional abilities is ensured, together with the comprehensive development of physical and will qualities, formation and restructuring of the necessary motor skills and habits. Naturally, the level of achievements due to sporting form depends primarily on the quality of the foundation laid.

Second phase is characterised by a relative stabilisation of sporting form as a system of components ensuring optimum readiness for showing good sporting results. It is impossible radically to restructure these components at the given phase because this would mean a complete loss of sporting form. Together with this there is a further perfectioning of all the factors upon which all the sporting achievements depend directly in the period when this form is being retained. That is why the results grow within the possibilities, which the regularities of the retention of the given sporting form allow.

At this phase variations of sporting results are practically inevitable. They are explained, on the one hand, by an expedient regulation of the athlete's prompt readiness at the training stages and his participation in competitions of various ranks (change of settings and the method of bringing the athlete to competitions depending on their importance), and, on the other, by periodic endogenic oscillations of the organism's functional state and the effect of the attending circumstances (meteorological conditions, specifics of sports facilities, etc.). Such variations of the results do not mean that sporting form is lost, if of course, their deterioration does not turn into a stable tendency.

Third phase is distinguished for the change of directiveness of the adaptive processes, switching of the organism's functional regime over to the general rehabilitat-

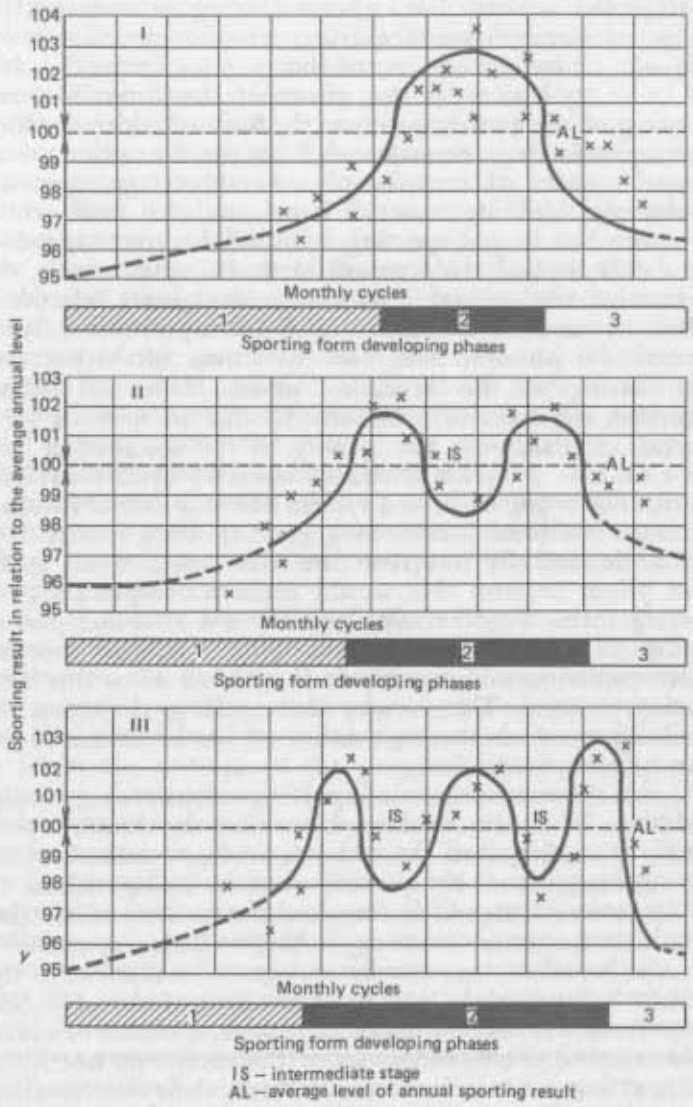

Fig. 16. Main types of the dynamics of the sporting results in an annual cycle and their probable correlation with the phases of the development of sporting form (on the example of the athlete-throwers).

ing level, weakening or partial destruction of the links which stabilised sporting form acquired earlier. However, this does not mean that the organism's vital functions are violated. In cases where the general life regime and the training regime are rationally organised, sporting form is temporarily lost not at the expense of the normal life activity.

Naturally, a question arises: why not retain sporting form permanently as a state optimum for the athlete? The answer will be clear from the following propositions. Firstly, sporting form acquired at this or that stage of the sporting perfectioning is a state optimum for the given (and not only for the given) stage. It is no longer optimum for the next higher stage. The desire to maintain permanently once-acquired sporting form would be similar to the desire to mark time. To progress, the athlete must shed the old form and create prerequisites for acquiring a new one. This demands far more considerable restructurings and improvement of all the components of the athlete's preparedness than the framework of stabilised form allows.

Secondly, due to a prolonged summation of the effect of training and competitive loads, necessary for acquiring and retaining sporting form, the organism's protective reaction is developed sooner or later against straining the adaptive mechanisms. If this is not taken into account the same loads which have led to sporting form, will play the role of stressors producing an effect of overtraining.

Thirdly, maintaining a complex dynamic balance between various biological functions and processes ensuring sporting form is a hard task in itself, especially for the athlete's nervous system. This task is made all the more difficult by the fact that it has to be resolved against the background of continuing changes in the organism's internal and external media and in stress conditions in which sporting activity abounds.

Thus, retention of sporting form is connected with considerable external as well as internal difficulties. They may be excessive and lead to unfavourable consequences, if the athlete tries to retain his sporting form too long. But this, as a matter of fact, is not necessary. On the contrary, retaining the old sporting form will impede the acquisition of a new form, i. e. would be an obstacle to new achievements.

1. 2. Phases of the Development of Sporting Form and Training Periods

The first natural prerequisite for the periodisation of the training process lies in the phase character of the development of sporting form. Sporting form is established, retained and temporarily lost as a result of strictly defined training effects, the character of which regularly changes depending on the phase of the development of sporting form. Three periods alternate correspondingly in the training process:

first period, in the course of which prerequisites are created and sporting form is directly established (preparatory period);

second period, during which sporting form is retained and realised in sports achievements (competitive period);

third period, which appears because of a necessity to prevent overgrowing of the total effect of training and competitions into overtraining, ensure the rehabilitation of the adaptive abilities of the organism and guarantee continuity between the two stages of sporting perfectioning (transitory period).

It is not difficult to conclude that these periods actually are nothing but consequent stages of the process of controlling the development of sporting form. The objective possibilities allow to influence directly the phases of its development, expediently shortening or lengthening them. Naturally, these phases cannot be infinitely lengthened or limitlessly shortened, since their terms are determined in great measure by the internal regularities of the organism's development and depend on a number of concrete conditions (level of the athlete's preliminary training, his individual abilities and specifics of sports, sports calendar, etc.). The preparatory period, in principle, cannot be shorter than it is necessary in the given concrete conditions for acquiring sporting form. The competitive period must not be longer than is allowed by the possibilities of maintaining sporting form without detriment to further progress. The transitory period depends first of all on the total volume of the preceding loads and terms necessary for a full rehabilitation of the organism.

The total duration of the big training cycle, and, therefore, the time limits of one cycle of development of sporting form conditioned by it is very often timed to nearly annual terms. As experience and research show this time in many cases is quite enough to ensure onward development of sporting form. In a number of sports (first of all in strength-speed sports) sporting form can be renewed in the annual as well as in semi-annual cycles. Terms less than six months are, evidently, too short for the big training cycles. According to certain data lengthier cycles than the annual may be, in cetrain cases, expedient but this calls for additional checking. Further on we shall speak only about annual and semi-annual cycles (or close to them in duration).

We may point out approximately the following justified periods of such cycles:

preparatory period —from 3 to 4 months (mainly, in semi-annual cycles) to 5 to 7 months (in annual cycles);

competitive period —from 1.5-2 months to 4-5 months;

transitory period —from 3-4 to 6 weeks.

Rational terms of the periods can be chosen within these limits provided that there are sufficiently varied conditions for planning training in most sports and for athletes of different qualification. The differences in the terms of the periods will be the more considerable, the greater the difference in the level of the athlete's preliminary preparedness, as well as in the degree of loads used in training and in the specifics of the chosen sport.

1. 3. The External Conditions of Periodisation of Training

The sports calendar has a definite effect on the concrete terms of training periods. Fixing the dates of official competitions, it shows the terms with due account of which the training has to be planned. Moreover, the system of calendar competitions influences the structure of the competitive period and partially limits the duration of other training periods.

From methodological positions the sports calendar must be planned with due account of the objectively necessary

periodisation of the training process. Only in this case it helps to plan the training process in the optimum way and, therefore, facilitates maximum growth of sporting achievements.

Competitions in many sports at present encompass the greater part of the calendar year, ranging in degree of importance and are distributed corresponding to the specifics of the training periods. Appropriate at the preparatory period are competitions limited in importance and having a clearly expressed training and control-training directiveness, or, in other words, preparatory competitions. Athletes participate in them, as a rule, without special precompetitive training– by way of preparing for major competitions. The latter are distributed within the limits of the competitive period in accordance with the objective terms of being "in form". The transitory period is usually free from compulsory competitions.

The external conditions changing with the time of the year have a definite effect of the terms of the periods and the selection of training means. But, as it has already been noted, they are not the determining factor for planning training. As the sport infrastructure develops (building indoor stadiums, skating rinks, swimming pools, routes with artificial snow and ice cover, etc.), the possibilities of quick movement to various geographic zones expand and the means and methods of training improve (use of special-preparatory exercises in "inter-seasonal" periods, etc.), the limiting effect of seasonal factors on planning the training diminishes more and more. The tendency of development of modern sport, therefore, is not to subordinate the training process to seasonal conditions but to free it from this dependence.

2. THE SPECIFIC FEATURES OF PLANNING TRAINING AT VARIOUS PERIODS OF THE BIG TRAINING CYCLE

2. 1. Preparatory Period (the Period of Fundamental Training)

The second name of this period given in brackets, is, in essence, more precise. It emphasises the fundamental character of training, conducted in the first period of the macrocycle and stresses that training in a broad sense of the word is conducted in various forms during the entire

macrocycle. The term "preparatory period", therefore, is not felicitous, but it is shorter and has come to stay in special terminology. Using it, one should remember that it is conditional and denotes, in essence, the period of fundamental training.

This period is subdivided into two big stages–so-called "general preparatory" and "special-preparatory". The first of them, as a rule, is more lengthy, especially with beginners in sport.

General preparatory stage. The main directiveness of training at this stage is the creation, expansion and perfectioning of the prerequisites on the basis of which sporting form is shaped up. The first of such prerequisites consists in enhancing the general level of the organism's functional abilities (strength, speed, endurance), as well as in supplementing the fund of motor skills. Therefore, general training is the main part of the training content (hence, the name–"general preparatory").

This must not be understood in the sense that the share of general training here always exceeds the share of special training. Their concrete proportions considerably depend on the level of the athlete's preliminary training, his specialisation, sports record and other circumstances. Such correlations (in the time expended correspondingly on general and special training) as 3 to 1 (mainly with beginners), 3 to 2, 2 to 2 may be justified. Justified here is the fact that general training always occupies a bigger place at the first stage than at following stages. Exercises, varied in effect (as regards to the selected sport), are represented here more widely and free variations in the use of exercises are allowed.

Special training at the first stage creates specific prerequisites of sporting form, ensuring the development of certain components of special training, mastering or restructuring habits and skills, included in the composition of the selected sports technique and tactics. The main means here are selectively directed special-preparatory exercises. Integral competitive exercises are used in limited volume and, mainly, in the form of modelling of forthcoming competitive actions. The thing is that frequent repetition of competitive actions in the form in which they have been mastered earlier would only fix the old skills and thus limit the possi-

bility of progressing in the new cycle to a higher level of sporting mastery.

The general tendency of training load dynamics at the first stage is characterised by a gradual increase of their volume and intensity with a preferential growth of the volume. **The main volume** of preparatory work to create a stable foundation of sporting form is done at this stage. The total load intensity increases at this point only because it does not exclude the possibility of an increase in its total volume right up to the next training stage. Such load dynamics at the first stage are quite regular, because the accelerated mounting of the general intensity would have meant the speeding up of training. This, although it does not exclude a rapid growth of the training level, cannot guarantee the stability of sporting form, which depends, first and foremost, on the volume of the preparatory work and the duration of the period in the course of which it has been done. It is exactly this regularity that is taken into account in planning training in the preparatory period. Modern sports methodics rejects any attempts to replace this period by some kind of superficial training.

The tendency of load dynamics manifests itself in a different way, depending on the kind of exercises and their purpose in training. It characterises in the greatest measure preparatory exercises aimed at the diverse development of work capacity. As regards exercises modelling forthcoming competitive activity, their volume increases gradually, especially within the limits of the first stage, while the intensity from the very beginning approaches the level adequate to the planned sporting result. When including these exercises in the first stage, care must be taken not to distort the general tendency of a gradual increase of the loads and at the same time begin to exert beforehand infuence on the specific mechanisms of the work capacity in the selected sport.

The typical forms of the mesocycles of the first stage are "involving" and "base". The latter are often longer than at the following stages due to a lower level of load intensity. The number of mesocycles of the given type depends on the degree of the athlete's preliminary training level, the total duration of the preparatory period and on other circumstances.

Special-preparatory stage. Training at this stage is restructured so as to ensure a direct establishment of sporting form. If at the first stage its fundamental prerequisites were created and perfectioned, now they must be developed and brought together as harmonious components of the athlete's optimum readiness for sporting achievements. Proceeding from this, all the aspects of the training content are concentrated so as to ensure a high pace of the development of special training level along with a thorough mastering and perfectioning of the selected technical and tactical habits and skills in the form in which they will be used in the forthcoming main competitions.

Sporting form is directly shaped up in the process and as a result of doing exercises which model and then fully reproduce in all the details forthcoming competitive actions. Therefore, no matter how the important general physical training is, its share at the second stage diminishes, while the share of special training increases accordingly (approximately up to 60-70 per cent and more of the total time set for training). The composition of the means of special training changes too—the share of the competitive exercises gradually increases.

Competitions as the preparatory period rounds up come to occupy an ever considerable part in training. At the same time they do not lose their preparatory character (try-outs, control-training competitions, etc.) and are included organically in the structure of training as an important means of training for the forthcoming main competitions. In this connection one of the typical forms of planning training at the second stage is the control-preparatory mesocycle, which includes a series of competitions limited in importance (they may be official on condition that they do not deprive them in essence of their preparatory significance).

Training loads at the second stage continue to grow, but not in every parameter. An absolute intensity of the special-preparatory and competitive exercises increases first of all. This is expressed in the increase of the speed, tempo, power and of other speed-strength movement characteristics. As the intensity grows the general load volume at first stabilises and then begins to shrink.

It is explained, firstly, by the necessity to create conditions for an essential increase of intensity—the leading

factor of the development of the training level at the second stage; secondly, by the need to facilitate long-term restructurings undergoing in the organism according to the "lagging transformation" mechanism with a big volume of preparatory work performed at the first stage. The results of the previous work done can be transformed into a swift growth of sporting indices only by reducing for a definite time the total volume of loads and increasing intensity correspondingly. The degree of volume reduction depends on its magnitude at the previous stage.

Load volume is reduced at the beginning at the cost of the general preparatory exercises. The volume of special-preparatory exercises continues to increase against this background. Then the component of the general load volume stabilises and is partially reduced. The exceptions are mainly competitive and close to them special-preparatory exercises, the total volume of which continues to increase.

Because of an increase of the general intensity of training average "waves" of the load dynamics at the second stage usually diminish (approximately down to 3 to 4 weeks). The structure of the training mesocycles changes accordingly with "shock" and "unloading" microcycles being introduced in them more and more often.

If one of the most important competitions follows immediately after the preparatory period, the concluding part of this period is planned as a pre-competitive mesocycle. The load and rest rhythm is so created and concrete conditions of the forthcoming starts are so modelled as to bring the athlete to them in the highest work readiness.

Variants of the preparatory cycle. The preparatory period structure can on the whole be presented as a system of mesocycles of different types, the composition of which changes depending on the overall duration of the period, specifics of the competition calendar and on other circumstances. It may be either full or reduced.

The following system of mesocycles is expedient in the conditions of the annual training cycle with a lengthened preparatory period typical for long-distance sports:

"involving"→"base" (general preparatory, developing)→"base" (stabilising)→"base" (special-preparatory, developing)→"control-preparatory"→"base"→"pre-competitive".

Given in this example is a full set of mesocycles of the preparatory period. Separate mesocycles in shortened variants, first of all, those from among the recurrent, drop out, while their functions transfer in this or that measure to similar mesocycles or close to them in type.

Here are a few of the possible variants:

1. variants of the reduced preparatory period in the annual cycle (mainly for speed-strength sports):

"involving" →"base" (developing→control-preparatory)→"base" (with pre-competitive elements);

"involving"→"base" (general preparatory)→"base" (special-preparatory)→"pre-competitive";

2. variant of the preparatory period in the semi-annual cycle:

"involving"→"base"→"pre-competitive";

3. variant of the preparatory period in the second half-cycle of the so-called double cycle (in which the second preparatory period begins without the preceding transitional period):

"base" (general preparatory)→"base" (special-preparatory) →"pre-competitive".

These examples do not exhaust the entire multitude of all the possible variants. Modern research on the problem of the sports training structure are aimed, in particular, at tapping all the wealth of justified variants of the preparatory period, precisely defining the conditions at which they become expedient and selecting optimum variants for the given concrete conditions. The most general criterion of the optimum character is the sporting result achieved after the preparatory period. In principle, it must exceed the previous result of the preceding training macrocycle or closely approach the given level (in sports which have no qualitative evaluation of sporting result, a corresponding criterion is set on the basis of the normatives in control exercises).

2. 2. Competitive Period (Period of the Main Competitions) and the Stage of the Immediate Pre-Competitive Training

2. 2. 1. Determining Traits of the Period

The immediate tasks in the competitive period boil down to creating most favourable conditions for the realisation of

sessions: all the system of bringing the athlete to a maximum result is aimed at them, load dynamics planned, etc. The interval between such competitions is set so as the work capacity is fully restored, but with due account taken of all the requirements of the full-scale direct preparation for decisive starts. All the concrete specifics of the given competitions are taken into account: programme, and the regime of the competitions, specific features of the rivals, sites at which competitions are held, their equipment, etc. The number of the main competitions must not be great—usually no more than 3 to 5 in a macrocycle.

Other starts of the competitive period are of principally different significance. No special training is held before them (besides separate control-selective competitions). They are the means of preparing for the competitions in combination with the training work proper. For this reason, as well as a relatively lesser psycho-physiological consequence the interval between the preparatory competitions may be considerably smaller than between the main competitions. In principle, it does not exceed the time necessary for a simple rehabilitation of the work capacity after previous competitive loads. In certain cases high-class athletes practice series starts with reduced intervals (for instance, 2-3 days). This regime of the competitive loads is similar to the regime of intensive training microcycles, part of the sessions of which is conducted against the background of the incomplete restoration of certain functional abilities. Due to this serious requirements to the organism stimulate a high work capacity.

The main competition, the introductory microcycle directly preceding it (or microcycles which may also include preparatory starts) and a short-time post-competitive unloading phase, as it has already been said, make up a competitive mesocycle—the main structural link of the competitive period. In the simplest case when this period is relatively short, it fully consists of two or three such mesocycles. In many cases, however, the structure of the competitive period is much more complex. Its peculiarities are preconditioned, in particular, by the quantity and order of the distribution of important competitions, requiring special pre-competitive training.

The final training stage for an important competition may coincide with the end of the preparatory training period (if the competitive period begins with one of the important competitions) and then is repeated (depending on the number of main competitions) within the competitive period. Usually this stage is one average cycle in duration. Only if the conditions of competitions are unusual special pre-competitive training encompasses two or more average cycles.

Despite a relatively small duration of the direct pre-competitive training stage special attention is paid to it both in theory and practice: the ultimate result of all the previous training work of many years depends directly on this stage.

Methodological tendencies. The central methodological problem of pre-competitive training is in the fullest possible modelling of the forthcoming competition. The modelling in the process of direct preparation for the main competition presupposes an integral reproduction of: a) competitive exercises, b) competition regime, c) its external conditions.

Modelling competitive exercises at this stage should reflect as much as possible the goal of exceeding the result attained earlier. If this is not so, modelling is incomplete and may lead to the fixation of all kinds of barriers impeding the achievement of higher results. Hence the main rule: better fewer but better. "Fewer"—in the sense of maximum limiting of the attempts which are not accompanied by the improvement of the qualitative and quantitative characteristics of the modelled actions. "Better"—in the sense of the progressive change and perfectioning of these characteristics. And not only in parts but on the whole—so that if possible every variant of the "model" brings the athlete closer to the goal. Series preparatory starts free from the maximum psychological tension can be of help here.

The regime of the main competition is modelled by reproducing its specifics in the structure of the training microcycles. According to the general idea of modelling, one must see to it that the model-competitive microcycle reproduced in the main the

the acquired sporting form into high sporting results. If this period is quite lengthy (includes several main competitions) the immediate task is to maintain sporting form. As it has already been noted, all those qualities, skills and knowledge are further improved against the background of its relative stabilisation which guarantees the athlete's readiness for sporting achievements. Separate components may undergo considerable changes in connection with the necessity of adaptation to specific conditions of the regular competitions. However, no radical restructurings are possible during this period, because they may lead to a loss of sporting form and thus make successful participation in the competitions impossible.

The main aspects of the athlete's training in the competitive period are characterised by the following directiveness: physical training assumes the character of the direct functional training for ultimate competitive tension. It is aimed at reaching maximum (for the given macrocycle) special training level, preserving it at this level and maintaining the general level of training reached. Technical and tactical training brings the selected forms of the competitive activity to a possibly higher degree of perfection. This, on the one hand, presupposes the fixing of the habits and skills acquired earlier, and, on the other, an increase of their variety and applicability to different conditions of sports struggle by a subtle honing of the coordination of movements and development of tactical thought. A direct tuning for the competitions, the mobilisation for the highest manifestations of the athlete's physical and moral forces, as well as the regulation of the emotional states and will manifestations during competitions, development of the correct attitude to possible sports failures and maintaining a positive emotional tenor, acquire special importance in the athlete's special psychic training.

All the aspects of the athlete's training at this period merge closely. The integral competitive exercises, which occupy a central place in training and are systematically performed in real competitions become the most important means and method on the basis of which the entire training is planned.

A special physiological and emotional background created by the conditions and the process of the competition intensifies the effect of physical exercises and facilitates the highest manifestation of the organism's functional abilities by tapping on the reserves which are difficult (and at times impossible) to mobilise fully in everyday training sessions. Irreplaceable is the role of competitions as a factor of perfectioning technical skill, accumulating sports experience, instilling specific endurance and psychological stability. Therefore, after sporting form has been acquired, competitions become the leading means and method of further perfectioning.

The frequency of participation in competitions and the total number of competitions depend, as it has been shown, on a number of concrete conditions and, first of all, on the level of the athlete's qualification and sports specifics. Thus, whereas in most speed-strength sports and in sports games high-class athletes may compete every week over the entire competitive period, in sports demanding ultimate manifestations of endurance, as well as in sports encounters and combined events intervals between competitions are usually much greater. At the same time the individual calendar of competitions in any case must be so eventful as effectively to stimulate the development of the specific competitive work capacity and of sporting skill.

Practically in all sports there are reserves of expanding competitive practice through additional performance in related sports exercises (for instance, in running distances similar to the main competitive distance) or according to an incomplete programme (for instance, in one of the events of the Nordic combined event, pentathlon, decathlon). It is especially important where competitions in the selected sport require big intermediary intervals. Filling such intervals with performances according to the lightened programme the general effectiveness of training can be considerably enhanced.

Irregardless of the fact whether the athlete competes only in one selected sport or performs in additional competitions they must differ in the degree of significance and directiveness. The greater part of the competitions, even in the competitive period, is, in essence, of a training and control nature and is used for bringing the athlete to most important competitions.

The latter become as if nodes of planning the training

target competitive microcycle (the order of distributing and alternating the load and rest over the days of the preliminary and final starts, specifics of the daily regime in these days, etc.). However, even at the stage of pre-competitive training it is not always expedient fully to liken the training regime to the competitive one. The degree of likeness, in principle, may be the greater, the more the competitive regime corresponds to full-scale training.

This also concerns the microcycle's duration. It is hardly expedient to equal the duration of the model-competitive microcycle to the duration of the competition, if it is more or less than one week. If the main competition takes, for instance, one or two days, the competitive regime can be modelled in one of the phases of the training microcycle without reducing its general duration to such a short period (otherwise there will be unjustified obstacles to the effective training work: the framework of the shortened microcycles will be too limiting for it). If the competition with all its stages will last considerably longer than one week, its regime may be modelled within the framework of the two or more microcycles. This will make the general organisation of training easier.

The external competitive conditions are modelled by recreating in the preliminary starts the specifics of the forthcoming rivalry in the condition of the main competitions, as well as by transferring training to the same, or possibly similar, geographical, climatic, material-technical and other conditions, in which the given competition will be held. This at times presents quite a problem, especially when the conditions of the main competition differ sharply from those habitual for the athlete (unusual climate, another geographic belt, requiring prolonged adaptation, etc.). While solving this problem, one must proceed from a concrete correlation of the positive and negative factors, arising in connection with the transfer of training to unnatural conditions. If the factors detrimental to training prevail (for instance, chronic lowering of the quality and quantity of the training work because of surrounding media), there is no sense in resorting to prolonged adaptation. As a rule, the terms of adaptation to the specifics of the conditions of the competition sites do not exceed 2 or 3 weeks.

Together with the modelling of the main competition and its conditions another necessary methodological tendency of the pre-competitive training is the optimisation of the prerequisites of modelling and demonstration of the target result on the basis of the directed use of the preparatory exercises in combination with additional training means, including extra training and extra competitive (medical, biological, rehabilitating means, specialised nutrition, etc.). Partial tasks may be directed, depending on the concrete condition of the athlete's training level, at a selective perfectioning of the elements of competitive actions, developing these or those components of special training, maintaining the general work capacity, assisting rehabilitating processes, and regulating athlete's readiness.

The system of microcycles. The two indicated lines of the pre-competitive training are uniform in their final directiveness, but do not merge methodically. They are mainly seen in microcycles of various types: model-competitive and training proper. The first, it is already clear, are planned as applied to the programme, regime and conditions of the main competition. Second, together with certain similar traits may be essentially different in composition and character of distribution of the training means, load parameters and specifics of its alternation with rest intervals. In the practice of pre-competitive training combined microcycles and others are also used.

The systematic alternation of the training microcycles proper and model-competitive (or combined) must be considered as the basis of an expedient pre-competitive training structure.

The following variants of the order of their combination are justified in certain conditions:

1. training microcycles proper and model-competitive microcycles alternate two or three times with the addition of the introductory microcycle at the end;

2. when it is necessary to ensure more profound training work against the background of training for the competition, the following variant can be most effective: "model-competitive" → "training" → "training" → "model-competitive"→"training"→"introductory".

In the last few years a non-traditional variant of planning

pre-competitive training undergoes approbation. It has received the name of the "pendulum principle". In a number of traits it is similar to the first of the above variants. The "pendulum principle" envisages the emphasised rhythmic alternation of microcycles of the model-competitive type and contrasting microcycles. As the main competition draws nearer the degree of specialisation of the model-competitive microcycles increases (content, regime and conditions of the sessions reproduce the character of the competitive actions, order and other conditions of the forthcoming competitions more and more fully), while in contrasting microcycles the opposite tendency is ensured (the share of the general training exercises is increased, the effect of active rest and varying the conditions of the sessions are used more widely, competitive exercises are executed mainly element-by-element, etc.). The rhythm of alternation of the microcycles is given so as the phase of the increased mobilisation coincides as a result of repetitions with the days of the competition.

Load parameters and distribution. The general volume of training loads within the framework of the pre-competitive training stage is distributed over the microcycles depending on the three basic alternating magnitudes: the load volume, used before this stage; the load volume at the given stage; time left before the competition. The analysis of vast factual material showed that the monthly volume of the basic training loads in many instances is subdivided by the weeks in fractions comprising (relative to the total monthly volume) approximately 35, 28, 22 and 15 per cent (with an average quadratic deviation of 3 to 6 per cent). Chronologically, counting from the beginning to the end of the stage, the loads corresponding to these relative magnitudes may follow (depending on other variables) in different order.

Variants	1st week	2nd week	3rd week	4th week
1	35	28	22	15
2	28	35	22	15
3	28	22	35	15
4	35	15	28	22

The first two variants are in essence of one type. Quite often they are justified when the total volume of the main

training loads at the given and preceding stages is sufficiently great, as a rule, not less than an average monthly volume in the big training cycle (for instance, with qualified lifters—nearly 1,300 and more lifts of the bar in a month. With divers this volume is 1,500 and more dives; with middle-distance runners—nearly 300 kilometres). In those cases when the total volume at the stage is relatively small (by 30-40 per cent smaller than in the given examples) two other variants of its distribution by weeks can bring good results.

Generally, the following rule is true: the more considerable the monthly load volume on the eve of the pre-competitive stage, the greater the possibility that the gradual reduction of the weekly volume (lst and 2nd variants) will be the most effective variant of the distribution of loads at the first stage. If the load volume on the eve is not great, its wave-like change in the microcycles of the pre-competitive stage (3rd and 4th variants or their like) becomes regular.

The optimum correlation of their volume and intensity is of special importance in rating the loads at the examined stage. Obviously, the total load volumes in the exercises of a definite intensity must correlate with each other at this stage in proportions close to normal static distribution.

Two explanatory examples. When making a statistical analysis of the loads during the pre-competitive training of weightlifters the following correlations have been found between parts of the total load volume (expressed in the total lifts of the bar in a month) and the magnitudes of the extra weights used ranging from 50 per cent to the maximum weight of the bar:

Extra Weight Ranges
(in per cent of the ultimate bar weight in corresponding exercises)

I	II	III	IV	V
50÷60	60÷70	70÷80	80÷90	90÷100

Relative Magnitude of the Load Volume in Each Range
(in per cent of the total number of lifts in a month)

6—12	22—28	30—40	22—15	8—5

Checking showed that in case of a sharp deviation from such correlations the efficiency of the athlete's training drops. This was the case of a sharp shift to the "left" (a considerable increase of the volume in the lst range) and during an excessive shift to the "right" (too many lifts in the 5th range).

A nearly similar picture was observed in cyclic sports. Thus, in the pre-competitive training of the runners, swimmers and rowers competing in comparable distances (correspondingly 800, 200 and 500 metres) the following correlations are observed in case of a successful showing:

Speed Ranges in Covering Training Distances (in per cent of the average competitive speed on the main part of the distance)

I	II	III	IV	V	VI
80÷90	90÷95	95÷100	100÷105	105÷110	110÷115

Relative Magnitude of the Load Volume in Each Range (in per cent to the total sum of kilometres in all the ranges)

3-12	8-20	20-40	40-20	22-8	8-2

It is obvious that here, too, the distribution is observed approaching the normal-static, but with its centre being in the ranges of the 95 to 100-per-cent speeds (not all the training distances have been taken into account but only those which were covered with the speed of 85 per cent of the individual average competitive speed and higher).

These examples, of course, cannot serve as the general guides but they demonstrate that despite the big variety of the training process and the fact that it is being influenced by many attending circumstances, it has quite definite stable correlations the knowledge of which permits the rational planning of training.

2. 2. 3. Variants of the Period's Structure

When the competitive period is prolonged (3, 4 months and more), its structure becomes more complicated. **Intermediate mesocycles** become the necessary links of such a period.

This is called for mainly for the following reasons:

1. in competitive mesocycles and at the pre-competitive stages despite the increased intensity of the loads, it is impossible to create constantly sufficiently powerful factors for increasing the general training level. The framework of these mesocycles is not spacious enough for expanding the general load volume. If the competitive period is too long, it leads to the readaptive reduction of the work capacity and then to worsening of the results, if this is not counteracted by intensifying the general factors of training;

2. the increased intensity of the physical and psychological loads in competitive mesocycles creates, with a sufficiently great number of starts, a real danger of overtension, if this is not countered by the reduction of tension during the training sessions for considerably longer terms than it is allowed in separate unloading microcycles;

3. sufficiently frequent starts and a one-type system of pre-start training introduce a certain monotony into the general regime of sporting activity. During a prolonged competitive period this becomes a serious negative factor. Introduction of intermediate mesocycles, which have expressed moments of contrast "shifts" in the shape of a partial change of form, content, and conditions of activity, makes it possible to counter this negative factor, thus creating favourable prerequisites for the following competitive mesocycles.

The intermediate mesocycles can be of two types: r e - h a b i l i t a t i n g - p r e p a r a t o r y a n d r e h a b i l - i t a t i n g - m a i n t a i n i n g. The cycles of both types, especially of the first one, may include separate training or checking starts.

The order of the alternation of the competitive and intermediate mesocycles depends on the general activity of the pre-competitive period, the specifics of the competition calendar, sports specifics and other conditions.

The following variants are possible:

1. "Competitive"→"competitive"→"intermediate" (rehabilitating-maintaining) → "competitive".
2. "Competitive"→"competitive"→"intermediate" (rehabilitating-preparatory) →"competitive"→"competitive".
3. "Competitive"→"competitive"→"intermediate" (re-

habilitating-preparatory) → "competitive" → "intermediate" (rehabilitating-maintaining) → "competitive".

The pre-competitive stages in the given variants are included in the composition of the competitive mesocycles (as their part). In special situations, discussed above, a longer period of special training in the form of a pre-competitive mesocycle is introduced before the most important competition.

When intermediate mesocycles are included in the structure of the competitive cycle, wave-like gradients usually appear in the dynamics of the sporting results, the number of which corresponds to the number of intermediate stages. These gradients must be distinguished from a real loss of sporting form, because its main components in the given cases are preserved, only the specific "tuning" at the sporting result is temporarily removed.

In practice very often circumstances arise which impede the planned construction of intermediate mesocycles (haphazard calendar of competitions, etc.). Then compromise solutions of sort have to be found. Thus, in some cases additional training load volumes are included in certain weeks and days of the competitive mesocycles (including in the days of competitions, immediately after the starts), so as to avoid the drop of the general work capacity. In other cases similar goals are attained by intensifying separate preparatory exercises on certain days and weeks. To diminish the general intensity of the training session, separate post-competitive unloading microcycles are somewhat lengthened. All this allows in certain measure to compensate the absence of intermediate cycles. However, the insufficiency of such compensation tells the greater, the more wider and intensive is the calendar of competitions. Moreover, these measures often contradict the rules of the optimum bringing of the athlete to another important competition.

Thus, a systematic alternation of the main-competitive and intermediate mesocycles, which in their aggregate form in various cases different variants of its structure is to be regarded regular for the prolonged competitive period with many starts. The entire diversity of the existing variants has to be studied and the conditions in which this or that variant is most expedient has to be determined.

2. 3. Transitory Period

It is a quite unique link in the system of the year-round training. Ensured here, first of all, is an active rest in the broad sense of the word, the aim of which is to prevent the overgrowing of the cumulative effect of training and competitions into "overtraining". At the same time this cannot be regarded as an interval in the training: conditions must be created to maintain a certain training level and thus guarantee the continuity between the current big training cycles and those which come to an end. It is obvious that in the conditions of active rest it is impossible to maintain maximum level of training, particularly special training. But it can be maintained at the level which would permit the beginning of a new training macrocycles from a higher position than the previous one.

General physical training conducted in the active rest regime makes up the main content of the training session in the transitory period. The latter has a broad meaning in this case: this is not so much the alternation of the work of separate muscle groups (a narrow meaning of the term "active rest") as the change of the entire character and conditions of the activity so as to ensure acceleration of the rehabilitating processes. In certain cases use is made of a complex of special-preparatory exercises so as to maintain a special level of training and to get rid of partial technical shortcomings. But this is justified only in those cases when there are no obstacles to a full-scale active rest.

In the transitory period one-type, monotonous loads are not advisable. At this stage varied exercises and conditions are specially important (in particular, conducting training sessions in the forest, in the mountains, etc.). It is also important to maintain vividly expressed positive emotions. The athlete has to have broad possibilities for selecting and varying the subject of sessions so that they are a pleasure and not a compulsory load.

The transitory period usually includes not more than two or three mesocycles planned according to the rehabilitating-maintaining and rehabilitating-preparatory ones. The microcycles comprising them are not rigidly organised. The same can be said about the regime of separate sessions. For instance, a free regime of many-day tourist hikes may

become the basis of the training session.

As any phase of the periodical process, the transitory period has no distinct, clear-cut borders. As the functional and adaptive abilities of the athlete's organism are being restored, this period becomes the preparatory period of the current big training cycle.

Sometimes a relatively short-time unloading phase of the rehabilitating mesocycle type or even of the microcycle is introduced instead of the transitory period. This happens often in those cases when the athlete did not receive sufficiently great loads (trained insufficiently during the preparatory period and took little part in competitions). In such cases it is expedient to plan training process according to the type of the "double microcycle", in which the second preparatory period follows immediately after the preparatory period and then the second competitive and only after that the transitory period. Such planning of training is justified also in some other cases (particularly, when using semi-annual training cycles).

3. ON THE SPECIFICS OF TRAINING PERIODISATION IN VARIOUS SPORTS

The general regularities of sports training periodisation are identified in various ways depending on the specifics of sports. This is already evident from the content of previous sections. On the whole the most important specifics are characterised below.

1. There can be quite considerable differences in the general duration of the big training cycle and in the duration of its periods depending on the specifics of sports specialisation. In sports, in which the requirements to endurance are great (marathon, ski races, etc.) annual training cycles are mostly used. In speed-strength and the like sports wide use can be made of semi-annual and such like cycles alternating them with annual cycles (weightlifting, speed-strength field and track events). Annual cycles permit the mounting of the general load volume within considerably greater limits, than semi-annual periods thus ensuring the fundamental adaptive restructurings in the athlete's organism and widely to renew the reserve of motor skills. Semi-annual cycles with their high intensity create conditions for an accelerated growth of the level of special

training and the speedy realisation of sporting results.

The alternation of macrocycles of different duration is practiced in training gymnasts and representatives of similar sports in which the competition programme changes periodically. Long cycles create favourable conditions for mastering a new programme, while shorter cycles facilitate mastering the programme faster.

The general duration of the big training cycle in various sports being equal, the duration of separate periods differs considerably. A most prolonged preparatory period is observed, as a rule, in training of long-distance runners, pentathletes and decathletes. The longest competitive period is also typical for such sports as team games (especially football and ice hockey). This is explained, in particular, by the fact that the sporting form of the entire team (team sporting form) may be maintained longer than the individual form, thanks to a systematic interchange of the players.

2. Sports specifics tell on the specifics of the stages, within the training periods and on the correlation of various stages. Thus, the training preparatory period in some "seasonal" sports may have, beside the main two stages (general preparatory and special-preparatory), an intermediate stage or sub-stage. Due to the absence of the necessary seasonal conditions (snow, ice, etc.) the athlete has to postpone the special-preparatory stage and replace specific means by similar, but not exactly adequate, training exercises (imitating, etc.).

The structure of the competitive period, arising from the sports specifics, is even more unique. The competitive period in sports encounters and games differs most sharply in this respect. The competitive period, for instance, of a boxer encompasses a relatively small number of the tournament competitions separated from one another by considerable time intervals, while, for instance, ice hockey players have official games every week or more often and practically without interval over the period of 5-8 months, and more.

3. There are considerable peculiarities conditioned by the specifics of sports in the correlations of the various aspects of training, observed by the periods of the training microcycle and in general. The general and special physical

training ratio, for instance, in training pentathletes and decathletes changes by the periods and stages of a macrocycle to a lesser degree than in a narrower sports specialisation. The share of tactical training in sports notable for a diverse and complex tactics (sports games and encounters) increases at the second stage of the preparatory period to a greater degree than when specialising in some sport notable for relatively standard forms of the competitive actions.

4. Partial tendencies of the load dynamics by training periods and stages are established depending on the sports specifics. Thus, the load level connected with the participation in competitions and in sports games vacillates by the macrocycle periods to a considerably lesser degree than in a number of other sports. The intensity of the specific loads in speed-strength sports tends to reach its maximum faster than in endurance sports. The strength load dynamics in the training of sprinters is quite different from the training of long-distance runners, etc.

Hence it follows that the general propositions of the periodisation of sports training must be viewed in each sport in strict accordance with its specifics. However, it would be wrong to counterpose the general and the specific and deviate from the general regularities under the pretext of originality of sports. When planning the training sessions it is important to rely on the general fundamentals of their periodisation and at the same time to observe its specifics depending on the given sport and on other concrete conditions.

Chapter Eleven

Sports Training as a Many-Year Process

It is very difficult to picture in detail the whole process of engaging in sport for many years. It includes practically an endless multitude of variables. The following three stages are singled out in a general review: 1) the stage of basic training; 2) the stage of the maximum realisation of the sporting abilities; 3) the stage of sporting longevity. Each of them includes stages consisting, as a rule, of several annual or semi-annual cycles. The first stage encompasses the stages of preliminary sports training and of initial specialisation, the second one—"pre-culminating" stage and the stage of record (highest individual) achievements, third—the stages of retaining and maintaining the general training level.

The training process, expressed in the changes of these stages and periods, changes according to the regularities of acquiring sporting skill and further sporting perfectioning, which are biologically preconditioned by the regularities of the athlete's age development (natural changes of the abilities of sporting achievements with the change of age, periods of the development, their stabilisation and age involution). The specifics of the stages of many-year training reflect at the same time the peculiarities of general life conditions (change of the free time budget and the general load when studying at school, serving in the army, with the beginning of labour activity, etc.).

The stages and periods of many-year training do not have strictly fixed terms. Their beginning and completion depends not only on the age, but also on the individual gifts of the athlete, specifics of his development, training record and on the conditions of the organisation of sports activity. The scientific outlook on many-year training has quite a few blanks. This is explained, above all, by the special difficulty of its research (in the given case each separate fact is measured by many years, that is why to record it is not a simple task). In this connection data expounded below is to a considerable extent approximate.

1. THE BASIC TRAINING STAGE

The approximate duration of the first stage is from 4 to 6 years (with considerable deviations depending, first of all, on the gifts of an individual and the specifics of the sport selected for specialisation). The main aim of sports training here is to lay foundations for future achievements: to ensure a harmonious development of the athlete's organism, to enhance the general level of his functional abilities, to create a rich fund of various motor skills, to form the initial bases of sporting skill. The setting for the demonstration of sporting results, if we speak about the rational approach, is realised at this stage so far as it is necessary for maximum achievements in the perspective, i. e., it is not an immediate aim.

The stage of preliminary sports training. In modern practice in a number of sports this stage usually begins at junior school age, sometimes earlier, and passes over to the next stage with the beginning of sports specialisation. The earliest terms of the beginning of sports sessions are set according to the official status for sports requiring mainly coordinating abilities (gymnastics, figure skating, certain sports games) and corresponding to the functional abilities of the growing organism in other respects (swimming).

We can speak about sports training before the beginning of sports specialisation only conditionally because its specific features at this stage are only beginning to shape up. The sessions are planned mainly according to the type of general physical training with a maximum use of the available means of comprehensive physical education and of general "sporting education" (shaping up of the fundamentals of the technique of sporting movements, included in the school syllabus additional sports sessions by the interests, participation in mass competitions according to a comprehensive programme, etc.). At this stage haste must not be shown in focusing on narrow sports interests. A more reasonable path is to give the young athlete a possibility to try himself in different exercises and only then to map out the subject of his future sports specialisation.

The stage of initial specialisation (specialised basic training). More and more attention is paid to the problems of the present-day selection and the beginning of sports specialisation. It is important, on the one hand, not to lose time, necessary for the achievement of the heights of sporting mastery and to make use of the so-called "sensitive" periods of the age development of the organism, when it readily responds to training by a swift progress of motor abilities. On the other hand, it is necessary, to avoid an excessively narrow forced specialisation, which although grants in the next few years a quick increment of sporting results, turns out to have very little perspective.

The system of special tests and indices for revealing the young athlete's gifts in this or that sport is only shaping up. The evolvement of methods of determining sporting talent is connected, in particular, with the search for separate informative hereditary indices. However, the problem of sporting orientation and selection is being resolved not

on this basis alone. It would be a grave methodological and pedagogical error to proceed from the notions of fatal hereditary predetermination of sporting achievements. They are always the achievement of an integral personality and not an organism's separate functions. Sporting and general education in the broadest sense of the word plays a decisive role in revealing and developing hereditary preconditions of sporting achievements. All other conditions being equal, sporting talent is a "talent of sporting industriousness". Its instilling from the very first stages of sporting activity decisively determines the ultimate sporting results.

The risk of error when selecting sporting specialisation diminishes if the abilities to perfectioning in this or that sport are identified with the help of a sufficiently broad complex of indices and stage by stage. We must attribute to the number of general indices of sporting abilities not so much the present level of sporting results as the shift of the results during a definite time after the beginning of specialised training (not infrequently, the novices showing in the initial tests mediocre sporting results find themselves among the best after a year or two of training), as well as the relation of the ratio of the increment of sporting results and the pace of the increase of the training volume.

A broad general specialisation continues to occupy the main place in training with the beginning of sports specialisation, ecpecially in those cases when specialisation begins at teenage and even earlier. It is expedient, as experience shows, to render initial specialisation a "multi-event" character. For instance, a swimmer masters at the beginning all kinds of sports swimming in equal measure, an athlete—in three events, in pentathlon, etc. This corresponds to the main goal, attained at the phase of basic training and at the same time avoids many mistakes when the subject of narrow specialisation is finally determined.

In certain cases a young athlete approaches the subject of main specialisation through some "introductory" specialisation in related sports (for instance, a future marathon runner goes through an initial specialisation while covering shorter distances). This path is inevitable, if training sessions begin earlier than the young athlete develops prerequisites for the main specialisation. The problem of initial specialisation is resolved uniquely in those cases when narrowly

specialised training in the selected sport is connected with the danger of the formation of the "speed barrier". Despite current opinion, the volume of exercises serving as the main subject of perfectioning, in the given case recurrent running in standard conditions with maximum speed, has to be strictly limited at the stage of initial specialisation in such sports as, for instance, sprint. Various exercises requiring nonstandard speeds (in particular, handball, basketball and other games with quick shifts in the rapidly changing situations) may be used for instilling speed abilities, as well as exercises which influence selectively certain factors determining movement speed: speed-strength abilities, movement coordination, etc.

The dynamics of sporting results at the initial stages is characterised by their rapid increase, which do not directly correspond to the volume of training loads (relatively little loads are accompanied by a more considerable increment of results than at the following stages). It can be assumed that this is due to a heightened response of the organism at the initial periods of its natural development and to an especially broad range of transfer at the first stage of adaptation of the training effect to training factors.

An increase of the volume without forcing a general training intensity must be the prevailing tendency of the load dynamics during the years of initial specialisation (practically, the annual increment of the volume of the main training loads at this stage very often fluctuates within 30-200 per cent and more). The intensity of exercises, naturally, also increases but the degree of the increase of the total load intensity must be rated in narrower limits than the increment of their total volume. A strictly defined load volume has to be observed very carefully during the intensive growth and ripening of the organism, when natural plastic, energetic and regulating processes sharply develop. This in itself is a load of a kind for the organism.

The big training cycles at the initial specialisation stage are characterised by the domination of the preparatory period. The competitive period is presented as if in a folded form. The general planning of training of the young athletes at this stage is linked closer than later on to the cycles of the school study year. This is seen in the planning of training periods, the terms of which are dovetailed with the

study terms and school holidays. The content and regime of the school load has a direct effect on the planning of training in the average and small cycles: time expenditures on training sessions, the order of their distribution over the day, week, month, etc., and, therefore, the volume of training loads, their dynamics and other traits of the training process depend in great measure on the possibilities allowed by the main study activity of the young athlete. As he matures with age and as the general level of his functional abilities increases and he masters the fundamentals of sporting skills, the training process acquires the traits reflecting the regularities of achieving high sporting results.

2. THE STAGE OF THE MAXIMUM REALISATION OF SPORTING POSSIBILITIES

About the regularities of the dynamics of sporting results in the years of extensive specialisation. The dynamics of the athlete's sporting achievements over many years may be presented in the general form as a parabolic curve (in those cases when sporting results are expressed in the objective quantitative indices; *Fig. 17*). It reflects an undoubted fact that in the first years of engaging in sport the results grow at a high pace. Then this pace gradually slackens (the volume

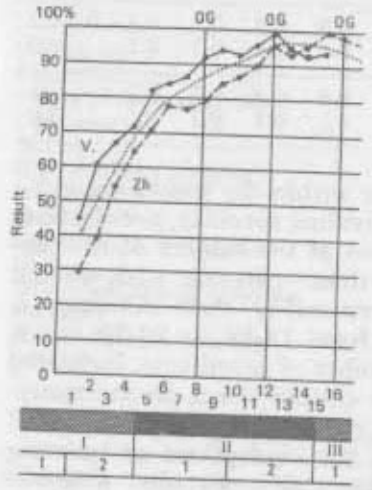

Fig. 17. **Actual dynamics of the sporting results (in per cent to the highest achievement) by the years of training of the two outstanding weightlifters (Vlasov and Zhabotinsky) and the levelled out tendency of the results of many years (dotted curve).**

Given below are the stages and periods of the man-year training in relation to the levelled out tendency. Vertical lines (OG)—Olympic Games.

of the increment of the result in the equal laps of time becomes smaller and smaller) and, finally, the tendency of the decrease of the result sets in (mathematically this picture is described in the first approximation by the equation: $Y=a+bX+cX^2$, where Y –is the value of the sporting result, X–ordinal value of the years of engaging in sport, a, b, c– rated coefficients calculated by the individual difference of results in adjacent years).

The processed actual data shows that if we take the increment of the result in the first year of extensive sports specialisation as a unity, the relative magnitudes of the increment of the result in the following years is very often restricted by the limits shown in *Table 18*.

Table 18

Examples of the Change of the Increment of Sporting Result by the Years of Extensive Specialisation (average data)

Sport	Years of extensive specialisation							
	1	2	3	4	5	6	7	8
	Limits of increment (maximum and minimum) in the share of increment in the first year of extensive specialisation							
Speed-strength	1	0.9 0.7	0.7 0.6	0.5 0.4	0.4 0.3	0.3 0.1	0.3 0.1	0.2-0.1 0.0
Cyclic submaximum and of great power	1	0.6 0.5	0.5 0.3	0.4 0.1	0.3 0.1	0.3 0.1	0.2 0.0	0.1 0.0

Variations of the increments within the ranges could be explained, probably, by the individual specifics, peculiarities of planning training sessions and of the subject of specialisation. It is known that biorhythms–two-year with women and three-year with men (presumably their influence is particularly strong at the age from 14-15 to 22-25 and is manifested depending on a number of conditions, including the specifics of a sport) have a certain effect on the many-year dynamics of the sporting results. This data, just as all others, relating to the effect of the biorhythms on sporting activity, needs strict checking and a detailed analysis.

When they acquire the importance of the precisely established and well-studied facts, they can be used in planning many-year training (not so much for forecasting concrete sporting results as for the optimisation of the system of distribution of the training and competitive loads).

The time of demonstration of the maximum sporting results depends, above all, on age prerequisites. Generalisation of the data about the age of Olympic champions, Olympic Games medalists and of other major competitions led to the notion about the "age of the highest achievements", i. e., age period, most favourable for demonstrating maximum results in sports. According to this data, this period coincides approximately with the ages given in *Table 19*. It is interesting that the average age of Olympic medalists in most sports has changed very little in the last 60 years.* However, in some cases, explained first of all by the individual talent of an athlete, athletes can be considerably younger or older.

Table 19

Approximate Age of the Highest Achievements in Certain Sports

Sport	Age	
	Women	Men
Swimming	16-19	18-19
Figure skating	16-24	17-25
Skiing (slalom, downhill)	18-25	19-25
Gymnastics	18-22	22-27
Boxing	—	21-25
High and long jumping	19-22	22-24
Basketball	19-25	23-26
Skating	19-24	20-25
Sprint (track and field)	20-22	22-24
Diving	20-25	22-26
Javelin and discus throwing	21-24	24-27
Ski races	21-25	23-30
Middle-distance running	22-25	25-27
Rowing	22-26	23-27

* There are exceptions in swimming and in women's gymnastics, where in the last decade a clear-cut tendency is observed that the winners in major competitions became younger by 2-3 years.

Continued

Athletic combined events	23-25	25-26
Football	—	23-26
Fencing	24-28	25-30
Triple jumping and vaulting pole	—	24-28
Wrestling	—	24-28
Weightlifting	—	25-30
Hammer throwing	—	26-30
Long-distance running	—	26-30
Marathon, walking	—	27-30

With due account taken of the singled out age zone of the highest sporting achievements and conditions at which they become possible, the main stage of many-year training can justly be subdivided into two above-mentioned stages—pre-culminating stage of extensive sporting perfectioning and the stage of highest achievements. They last approximately from 8 to 12 years. This is the time of the most active engagement in sport, flowering of the sporting abilities and mastering the heights of sporting skills.

Pre-culminating stage. The specific regularities of sporting training receive at this stage their full expression. The training process acquires clear-cut features of extensive specialisation. The share of special training (physical, technical, tactical, psychological) increases considerably, usually not so much due to general training as to an increase of time spent on the special-preparatory and competitive exercises. The total volume and intensity of training loads increase more considerably than at the previous stage. A number of parameters of the general load volume (the total time expenditures, the number of training sessions and some others) not infrequently reach at this stage an individual maximum. At the same time the competitive practice increases considerably and its effect on the content and structure of training intensifies.

The system of training and competitions as the athlete improves his sporting skill becomes more and more individualised. Training is planned depending on whether the athlete enters or not the sphere of big-time sport (the sport of highest achievements). The subjective setting in any case may retain the directiveness toward an individual maximum,

but it is being realised only in a measure in which the actual conditions of sporting perfectioning allow. If sporting activity is organised in accordance with objectively necessary conditions for top results, it, absorbing more and more time, becomes one of the main spheres of the athlete's life activity and dominates the general life pattern. It is quite understandable that only those who possess outstanding sporting abilities take this path.

The stage of the highest achievements. As the title shows, the given stage, in principle, must coincide with the age most favourable for sporting achievements. One of the factors of the general organisation of the athlete's training, claiming high achievements, is the periodisation in holding major competitions, for instance, Olympic (four-year) cycle. Having appeared traditionally as an organisational category, it now makes a major impact on planning many-year training.

The regularities of the structure of the training process within the framework of the Olympic cycle have not yet been studied sufficiently enough. According to the existing notion it is made up in some cases of the four-year training cycles and in others—of the combination of the annual and semi-annual cycles. The generalisation of the practical experience makes it possible to present the following structure of the four-year cycle as one of the justified variants:

lst and 2nd years—annual training cycles with an expanded preparatory period (period of fundamental training); training process is mainly aimed at increasing the general level of the athlete's functional abilities, mastering new forms of sporting technique and tactics (including, if necessary, the transformation of the skills mastered earlier) and the optimisation of other prerequisites of the target achievement in the Olympic year;

3rd year—modelling the main traits of planning training and the system of competitions planned for the Olympic year, approbation of the model;

4th year—realisation—reproduction with a maximum level of achievements of the model (with corrections if necessary).

This four-year cycle can already be introduced at the pre-culminating stage. It is quite clear that this is not the

only possible version of planned training in the Olympic cycle.

Much depends on the training record and the athlete's competitive experience. Thus, for an athlete who has already undergone tough training and participated in the major competitions, it may be expedient to conduct the first year training of the current four-year cycle mainly in a lightened regime (with a considerable volume but with a cut-down total intensity of the training loads and reduced number of competitions).

The general increment of the main volume of training by the years of the four-year cycle is frequently distributed in three variants. If they are expressed in the shares of the general increment of the volume in a cycle, they look approximately like this:

	1st year	2nd year	3rd year	4th year
1st variant	0.45	0.35	0.15	0.05
2nd variant	0.25	0.35	0.20	0.20
3rd variant	0	0.5	0.2	0.3

The first two variants are observed more often in athletes with a relatively small training record. The third—more often in "veterans" with the absolute magnitude of the increment of the load volume being as a rule smaller.

3. THE STAGE OF SPORTING LONGEVITY

The stage of retaining the achievements. No matter how rationally the training is planned, sooner or later the age stabilisation sets in and then begins the decline of the functional and adaptive abilities of the organism. This borderline is rather individual and depends practically on various conditions. There are many cases when athletes after 40 years continue to progress in some sports (for instance, in long-distance running, ski races, weightlifting) or retain their record achievements practically in full measure.

There is every ground to think that the drop of sporting results observed after 6 to 10 years of extensive specialisation is transient. It results, in all probability, from two reasons: biological (natural decrease of the adaptive abilities

with age) and imperfect planning of many-year training. Further rationalisation of the training process and improvement of the entire organisation of sporting activity, undoubtedly, will facilitate the retention of the achieved sporting results. An expedient change of the structure and content of training at the given stage must play a considerable role in it. Together with the limited growth of the general load volume, the periodic increase of its components is quite justified. Practically inexhaustible reserves of retaining sporting results lie in perfectioning sporting technique and tactics and enriching competitive experience. The change of composition of the means and methods of training, varying its general forms of planning (use of different variants of training macrocycles—"double" with an extended competitive period, etc.), may serve as an additional factor of stimulating the increase of the training level.

The stage of maintaining general training. Usually at the age of 35 to 40 sporting activity considerably diminishes. It is important that the restructuring of the entire training process at this stage ensures the retention of a high general work capacity. The content of training at this stage assumes in great measure the health-recreative character. But for a real athlete sport never ceases to be a factor of the sporting achievement. Only the concrete aim of the achievement changes. Now it is the fixation as constant properties of the organism and personality of all that is of value that the preceding years of engaging in sport has given. Sporting longevity in this sense is the equivalent of the creative longevity.

Such, briefly, is the many-year process of sports training. Many research institutions are busy today studying its regularities in detail. The reason for concentrating scientific forces in this field are quite understandable: the increasing significance of sport, above all, as one of the most effective means of a comprehensive and harmonious perfectioning of a man.

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