

# The General Principles of Training Applied to Training Gymnasts

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## Introduction

Eastern European gymnastics has been enormously successful, but has also substantially developed the sport. Scientists in these countries have devoted much time and research to developing principles for training athletes, including gymnasts. These principles have been compiled in textbooks and used to educate their best coaches. In particular should be mentioned three, classic textbooks: Lev Matveyev's *The Fundamentals of Sports Training* (1981) from the Soviet Union, the team of East-German authors led by Dietrich Harre that collaborated on *The Principles of Athletic Training* (1982), now in its seventh edition and Tudor Bompa's *Theory and Methodology of Training* (1990), now in its second edition. Bompa is from Romania but now works in Canada.

The prowess of Soviet, East German and Romanian teams in gymnastics is legendary. Their coaches were educated with these classics as their textbooks. The relevance of these principles for gymnastics is indisputable. But these works and the ideas they express are not always well known or applied here in the United States. The following sequence of thirteen training-methodological principles are gathered from the works of L. Matveyev, D. Harre and T. Bompa, and integrated by Dr. W. A. Sands for a course in Training Theory at the University of Utah.

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must necessarily be tackled with improvisations. At times it seems that the capacity to improvise is the main quality of a successful coach. However, it is better to modify an existing plan, than to have no plan at all. Training is more effective if there is a plan. The principles of training are concerned with such plans.

The object of a systematic, effective approach to preparing athletes for competition is the creation of the best possible plan. The principles of training are guidelines for the creation of such a plan. Every training plan should run the gauntlet of these principles, be compared to them and seek inspiration from them. Note that no hierarchy of principles is implied by the order in which the principles are discussed. Individual principles cannot be considered in isolation, but as different aspects of a complex, multi-faceted process. This is true for all sports, but particularly for gymnastics due to the variety and intensity of demands made on the athlete for successful performance.

In essence, the training of the competitive gymnast is a pedagogical process. The role of the coach is that of a teacher. It aims not just at increasing the

physiological performance potential of the athlete to a higher level, but a development of the entire psycho-motor personality of the individual (Martin, 1977, p. 4.). Therefore it is a complex process with interactions of many factors. These factors can express themselves both sequentially and simultaneously (Sands, 1992, p. 1). They find their complex, integrated expression in the composite, sports-motor act during competition. It is my hope that this exposition of these principles will help coaches with the organization of their improvement by training.

## I. The principle of increasing demands

The content of gymnastics training is exceptional by its range and complexity. To be appropriately prepared for performance, the gymnast must have completed training of a wide range of content: strength and conditioning, skill training, dance, musicality and dramatic expression as well as joint mobility. Therefore, just to attain a minimum training load in each area, the sum of different demands alone becomes a substantial volume of training. In addition, gymnastics is a sport where it has been clearly demonstrated that when demands are increased, functional indicators increase, and performance usually increases (Ukrain, 1975; Sands, 1992, p. 2).

As an indication of typical training load increase relative to performance level, W. A. Sands (1984, p. 34) recommended that:

- A gymnast who is a member or an aspiring member of the senior national team (age 15 years or older) should be training from 25 to 35 hours per week. ('Aspiring' means that the gymnast is actually in contention for such a position, not simply that she desire it).
- A gymnast who is a member or an aspiring member of the junior national team (age 12 to 14 years) should be training 24 to 30 hours per week.
- A gymnast who aspires to be a top Class I or advanced level gymnast should be training 20 to 30 hours per week.
- A Class II gymnast should train from 16 to 25 hours per week.
- A Class III gymnast should train from 16 to 20 hours per week.

These are guidelines. Other guidelines proposed by A. Gadjos (1983) from Czechoslovakia involve an even greater training quantity at even younger ages. However, it does not appear that these quantities have changed substantially since the mid-1980s, perhaps because there are still only 24 hours in a day.

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Substantial training loads are thus the rule almost from the very beginning of systematic gymnastics training. In order to adequately prepare the athlete for almost any level of gymnastics competition, the coach must increase training demands substantially, relatively early in the athlete's career. The athlete then attains exceptional levels of training volume at a relatively young training age. This is true at the microcycle, mesocycle, and macrocycle level.

However, it is necessary to increase training demands continuously in order to assure continued progress. The gymnast adapts to current demands and then training has less effect. But past a certain point, it is inefficient to increase training demands by volume alone. After attaining a certain performance and training level, demands should be increased primarily by increasing intensity, particularly in the conditioning, technical elements of increasing level of difficulty, and combinations and routines of increasing complexity. This increases power, tactical complexity and demands on the coordinative capacities of the gymnast. If demands are increased by volume, excessive training volumes result that have too little relationship to gymnastics performance. The risk of overloading injury (wrist, ankle and lower back) becomes excessive.

An important aspect of training demands in gymnastics is the intermittent nature of the practice. The motor intensity of each individual exercise is relatively high (acyclic, explosive and static strength movements). Therefore, relatively long pauses are required between each attempt. However, these pauses can be organized in different ways to progressively increase the training demand dependent on training session of the microcycle, training period or training age. For example, pauses between attempts at bar routines or combinations can be filled with stretching of the lower body.

In this country, there is often sufficient equipment for each athlete but insufficient personnel. In other countries, time spent waiting for one's turn is used for supervised conditioning exercises as well as recuperating. A judicious selection of complementary exercises can permit the athlete to continue training activity and still be recuperated enough when their turn at the apparatus comes. A high training age and the habit of a high density of training can prepare this regime. Organization of the training as a circuit also facilitates more continuity in activity. For example, during routine training the athlete can do alternating vaults and pommel horse routines in relatively quick succession. This is because vaulting is primarily an explosive, short-duration, lower body effort while pommels is primarily muscular endurance, upper body effort. Thus, training density can be increased. A limitation to such an organization would be the repeated putting on and taking off of hand guards and special taping, which can take a long time.

Analyses of performed training has shown that not just quantifiable increases in training factors can increase training demands. A change in organization of an equivalent training quantity

seems to increase demands, thereby causing an adaptive reaction (Werchoschanskij, 1985). W. A. Sands and J. A. Major (1991) have shown in a unique, longitudinal study of collegiate gymnastics, the standard sequence of training periods in gymnastics (conditioning-skills-combinations-routines-competitions-transition) tends to produce a new/higher demand at each transition, as witnessed by fatigue and injury indicators.

The role of the competition in gymnastics seems to be particular. Competitions seem to be associated with a high risk of injury. In addition, preparing the routines for competition seems to require great amounts of practice. Therefore, the gymnast participates in relatively few competitions. Whether or not these are supplemented by competitions of lesser importance or internal tests seems to vary from team to team. Therefore competitions are not a significant element in the total training demand.

Very little research has been done on the rational organization of partial and general training effects outside of Werchoschanskij's *Effective Training* (1985). It is likely that here are untapped reserves for increasing the effectiveness of gymnastics training but more systematic research is needed.

## II. The principle of continuous load demand

Given the young age of the vast majority of gymnasts, the principle of continuous load demands is closely connected with the learning and development of good training habits. The goal is development of training habits that will permit the athlete to attain their highest, individual performance potential as well as a life-long interest and need for physical exercise, health and fitness. The development of such habits probably has a greater chance of success if started young. One of the tasks of good gymnastic training planning is to bring the gymnast progressively, but as quickly as possible, to a self-motivated regime of 8-12 training sessions per week, throughout most of the year.

Gymnastics is a year-round sport at almost any level. The training is largely indoors and hence not influenced by seasonal or climatic conditions, facilitating training continuity. But given that the age of the vast majority of gymnasts is very young, the training of the gymnast is fundamentally influenced by the scholastic calendar and schedule. As the scholastic calendar and schedule is discontinuous, it is very difficult under a regime where the scholastic activity of the athlete is not adapted to the requirements of gymnastic training to achieve a minimal continuity in the training load. This is a key hinderance to the continuity of the training process in gymnastics.

In addition to the model where scholastic activity is adapted to the requirements of preparing the gymnast, there are two other microcycle models. One is the exploitation of weekends and vacations for two-sessions per day, with days of little or no training during the scholastic week. The other alternative is a double load of school plus training during the week with more complete restitution during weekends, and not least, less

disruption of normal child and family life. D. Martin noted (1980) that such child-athletes quickly arrive at a work-week of more than 40 hours between sports and school. Seemingly, the child has a greater capacity than the adult! Obviously, the pedagogical responsibility of the coach for managing such a situation is heavy (Martin, 1980, p. 259-265).

Competitive gymnastics is a dangerous activity. Fortunately, it is possible for the injured athlete to complete a significant training load, even when injured. This assures a high level of continuity in the training.

Due to the high intensity of the training content, the stress on the motor apparatus of the body is high. The risk of overuse injury and trauma is correspondingly important. The need for training continuity must be balanced with the need for regeneration and generalization training, i.e. swimming, hiking, track and field activities. Probably, during this training the athlete's specific performance capacity will deteriorate. This must also be considered with the issue of body composition and nutrition: during transition periods, should the athlete be allowed to relax their strict diet, and plan on a fat-reducing campaign later, or maintain strict diet, returning faster and with less discomfort to more normal performance potential? Note that this issue is also a health issue (i.e. amenorrhoea, osteoporosis, age at menarche).

### III. The principle of cyclic arrangement of load demands

Besides the influence of the scholastic calendar, which divides the annual (training) period into ones concurrent with school activity and ones without school activity (vacations), the gymnastic competition calendar is divided into two competition periods.

The two competition periods per year and their respective preparatory periods create two repeating cycles of training, called a double periodization. This double periodization can have the advantage of accelerating the development of the athlete. Competitions are a powerful stimulus, the most specific training being the competition itself. With the double periodization there are two sets of competitions. Double periodizations are most beneficial for the development of the more experienced, better performing athletes.

However, frequent competitions and the double periodization of gymnastics is negative for the development of the youngest athletes. Competitions can have a negative effect by shortening the period during which psycho-motor abilities, prerequisite for efficient skill acquisition and performance, are systematically developed. Training volume that could otherwise be devoted to the preparation and acquisition of new skills and higher difficulty is used for training routines and immediate competition preparation. The training demands must also be reduced prior to each competition in order to give the gymnast opportunity to rest and recuperate to an optimal state for the competition. Thus, there is less training available for conditioning, learning and progressing.

This is not to ignore the powerful motivational factor that competitions represent. This influence could perhaps be preserved in alternate forms, with less disruption of the long-term development of the gymnast, with tests, demonstrations, informal meets and the like.

Within each of the two periods, similar cycles follow in a relatively standard sequence of mesocycles of emphasis on:

1. conditioning and learning of (new) skills
2. combining skills and performing combinations of skills
3. creation and performance of partial routines and full routines
4. competition period
5. transitional period (usually informal)

Three aspects of this sequence should be stressed:

- emphasis on the one or the other activity by no means excludes other training content. For example, dance and conditioning usually proceeds parallel with the other training during all periods;
- it can be argued that the content of the periods and their sequential organization has more to do with the learning process than with physiological adaptation of energy systems to training (Stark, 1984, p. 5). Note that there is a definite tendency in actual gymnastics training practice to increase training volume and intensity simultaneously,

and what is perhaps even more unusual, as the immediate preparation for important competitions. This practice would be difficult to interpret within the theoretical framework of periodization based on the morpho-physiological adaptation of energy systems to training demands. While this adaptation is certainly important, it's role is perhaps more as underlying factors. This practice is more easy to explain on the basis of the logarithmic learning curve. In this case, training must be interpreted on the basis of learning processes. Training volume then is principally a means of overlearning, of stabilizing the performance of certain skills. This is opposed to training volume's role as major stimulus for biological adaptation;

- as exceptional levels of motor capacities are prerequisite for successful skill performance, perhaps a more intensive and extensive period of development of these capacities should precede the skill acquisition and routine periods. The idea being that these could be shortened, and made safer. The athlete would then be considered to be adequately prepared for what they were going to learn and perform, prior to being asked to do it. This is in contrast with the current practice of developing underlying capacities parallel with skills and routines. A potential difficulty might be the motivation of the athletes during a sustained period of physical conditioning. However, this would then be a pedagogical task for the coach.

### IV. The principle of planning and the use of systems

Dietrich Martin wrote that, "Also the practice of sports will be, to an increasing degree, required to make use of theoretical, cybernetical models,

and basic rules, to solve its problems" (1980, p. 143). Cybernetics is the study of systems in biological and mechanical systems. There is no alternative to cybernetical training systems as the achievement of a goal, with the help of appropriate interpretation and systematic use of modern training methodology, is a typical example of applied cybernetics. (ibid.) The systematic essence, as well as its dynamic, self-regulating character, of well-planned training is captured in its characterization as cybernetic. Cybernetic feedback systems like W. Smolewskij's (1978) for Soviet gymnastics are the most appropriate systems.

As an indoor sport, gymnastic training has relatively few external influences that make the coach improvise. This can permit a great deal of standardization and refinement of the training process. If approached systematically, gymnastics lends itself well to the development by successive improvement of highly-effective training systems. Such a system must be based on the socio-economic and political context where the gymnastic training will take place and where the athletes live.

Such a system proceeds in a sequence of steps, each with feedback loops (see Smolewskij, 1978, p. 418). Therefore they are not numbered. However, they are listed here in sequential order. These stages are:

- Determining the goal(s) of the preparation period
- Prognosis of the results
- Modelling of the training parameters
- Selection of the athletes
- Planning of the training
- Creation and execution of the training program
- Control of the training by testing
- Adjustment of the training on the basis of control results
- Eventual revision of the goals of the preparation period.

*Note: in order to function effectively, at each stage there must be as much quantification as possible in order to permit comparison of goal and actual values.*

#### **Determining the goal(s) of the preparation period**

The goals are set from what is desired and what seems to be necessary to satisfy the participants. Referred to here are general and specific goals. First, there are outcome goals such as team ranking, medals etc. Second, outcome goals for individual athletes.

A wide range of considerations determine the goals that can, and should, be set for the predetermined preparation period. First, the goals can be determined by economic, athletic, political, pedagogical considerations, as well as all possible combinations. Essential is that these choices are made consciously and are operationalized with quantifiable characteristics. The duration of the preparation period is the other choice that must be made and is considerably less problematic to quantify. Examples are Olympic cycles, annual cycles, career "windows" (see Sands &

Henschen, 1992) or periods of specific preparation for the increase of limited goals: increase jumping power, learn the new compulsory routines, incorporate this or that skill into the competition routine, etc.

#### **Prognosis of the results that will be required to attain those goals**

Once the goals that are necessary to attain have been identified, from past competitions the results can be extrapolated that will be necessary to attain those goals.

Gymnastics does not have world records. The results of competitions are not standardized, and therefore difficult to compare. Prediction of performance standards is possible however. Linear regression is one technique. Interpretation is another. What is involved is 1) level of difficulty of the selection of skills in the optional routines, 2) details of performance of certain aspects of the compulsory routines, 3) number of major and minor deductions that are possible to accept and still contend for a medal:

1. The level of difficulty, number of technical elements of D, C, B and A level as well as choice of skill. However, there are also styles and fashions that must be taken into account. It also appears that the all-around winner can compensate for a certain lack of originality and difficulty with what the judges perceive as error-free execution.

For example, it seems apparent that contenders for individual medals on uneven bars at the next Olympics and World Championships will have to present at least two, if not three, release elements as well as swings with the arms rotated in the shoulders and a dismount with double rotations around the horizontal axis (and one rotation around the sagittal axis).

2. Details of compulsory routine performance. The specified details of execution represent the mini-

specified details of execution represent the minimum standards of performance. Very often these are joint mobility demands, which give concrete standards for the joint mobility conditioning. In addition, creativity is necessary to find original and extreme variations in execution.

3. Number and type of deduction. It appears that a male World or Olympic champion can permit himself one major deduction (i.e. a fall) and still be competitive for the World Championships. This is not possible for females. Execution of compulsory routines and composition of optional routines for women must keep this in mind.

#### **Selection of the athletes**

Based on the extrapolation of the development of performances, gymnasts are selected in a continuing process that are likely to be able to attain these performances. Anthropometric, cognitive, motor and social measures can be used to estimate the likelihood of success. The selection process is a continual one.

#### **Planning the training**

From the performances estimated to be necessary, the training can be planned. The planning

process is a reciprocal process where the macrocycles determine the mesocycles which determine the microcycles which in turn, determine the content of each workout. In turn, the actual results of each training session are compared with the plan, eventually provoking revisions at any or every level. The entire process is steered towards the goal to be accomplished.

#### **Creation and execution of the training program**

This is the "physical" part of the process. Creation and execution are concerned with two problems: effective use of training time, and prevention of injury. In addition, of course, there are concerns of learning the skills, combinations and routines as well as progress in performance capacity.

#### **Control of the training by testing**

At regular intervals, progress in the various areas of training content is measured. Objective, quantified tests give feedback information upon which to adjust the training to increase effectiveness. The tests should disturb the training as little as possible and the feedback must be extremely rapid. Needless to say, gymnastics in our country suffers from a paucity of standardized performance tests, norms, and application of such procedures. We often fumble in the dark, relying on subjective experience.

#### **Adjustment of the training on the basis of test results**

The test results are compared with the planned results and adjustments made. The athlete and coach must know if they are on track before the competitions begin. At the competition, it is too late to make any significant corrections. Adjustments must be continually made if the athlete is to hit their "window of opportunity" (Sands & Henschen, 1992). This is the essence of the dynamic nature of the training process.

#### **Eventual revision of the goals of the preparation period.**

The goal vs. current value comparison is the basis for revision of the goals of the preparation period. In this way the continual decisions that must be made in the course of a training session can be guided by timely, conscious, informed decisions. Corrections are made, but rarely improvisations.

And the process repeats itself.

Training systems are also important on a micro level, concerning training in a single workout. For example, M. Ukran (1975, p. 168) states that results of pedagogical experiments show that pupils learning gymnastic exercises according to algorithmic tasks use 30% less attempts than with the usual training method. Training algorithms are defined as path descriptions containing a proscribed number, order and content of steps in a process to attain a functional goal. W. Tscherburajew (1989, p. 57) also notes that the method of algorithmic instruction is the main method for training the coordinative capacities of

the gymnast. It is his experience that this is a highly effective training method because it assures the planned development of the coordinative capacities during the first stages of the career of the gymnast. (ibid. p. 58)

#### **V. The principle of visual presentation**

This is a basic, pedagogical principle not just limited to the visual communication of knowledge, but includes other means of teaching and communicating information as well. It is primarily an expression of the practical pedagogy of the gymnastics training. The presentation of information in gymnastics training is concerned with two areas: skill learning and development, and readiness to perform.

**Readiness to Perform:** Much of gymnastic training is inherently amusing, some is not. It is important that the athlete identify themselves with the program and thereby become more self-motivated. In particular, it is important that the athlete know why and understand the need for each change in training load demands, particularly those involving an increase in load. This is essential for the active participation of the athlete. This can most easily be achieved with graphical representations of the training plan. The training load for macrocycles, mesocycles and microcycles as well as individual training sessions can be graphically displayed in the training location. In this way the athlete becomes more responsible for their training, and thereby their results.

**Skill Training:** Gymnastics has advantages among sports in this area as the goal of gymnastic training is ultimately the performance of a skill/compulsory routine as closely as possible to an defined ideal. This ideal is also visually represented in the form of drawings in the *Code of Points*.

The cooperation between the coach and athlete during gymnastics training is exceptionally close.

The coach may draw pictures and show photographs and photosequences of the ideal performance. It is common that the coach will have a skill, positive detail or performance error demonstrated by another gymnast. Video is used to some degree, although it seems that most coaches estimate the training time used filming, rewinding, looking and filming again as seldom worth it. Video recordings of actual performances in important competitions are precious aids in planning the training. In addition, coaches commonly talk the athlete through the exercise, giving audio cues, instructions and reminders. These are sources of fast-feedback as according to W.S. Farfel (1980), a potent aid to learning. The coach will also manipulate the athlete through movements and positions in order to communicate kinesthetic information. However, for various reasons, most coaches tend to over-verbalize and not exploit the possibilities of visualization.

A central problem in visual presentation in gymnastics is whether to work on an internal visualization, concentrating on the athlete's own experiences (visual, kinesthetic, audio) as experienced by the individual, or an external visualiza-

tion, the form of the movements as they are seen by an outside observer (i.e. coach or judge). The two approaches are fundamentally different. It can be speculated that internal visualization has greater potential training effect.

#### **VI. The principle of feasibility**

The principle of feasibility is the guide out of a fundamental paradox of training: when the athlete is performing without frequent errors, the motor task is mastered but little learning is taking place (Magill, 1989, p. 416-419). When the athlete is making relatively frequent errors, then genuine learning is taking place, but often at the cost of frustration, loss of self-confidence, and self-esteem. In addition, there is the danger of injury associated with an error; a danger inherent in gymnastics training. The training demands placed by the coach on the gymnast must be feasible for that individual athlete; demands must be individually optimal.

Obviously, careful, continual evaluation by the coach of all of the components of the training process is required to optimally control the evolution of the athlete's development. Frequent, objective measurements are necessary. Writing down performance objectives, training factors and test standards for each training phase eliminates the random approach still utilized by many coaches (Bompa, 1990, p. 133). Needless to say, in gymnastics, inexperienced coaches often seem to err on the side of too great demands.

Very little objective information is known about the training potential of the pre-pubescent athlete, which gymnasts are for a majority of their careers. Testing and careful tracking can give more familiarity with the adaptive reactions of the individual athletes. Information of this kind will influence the training process on many levels, in particular the systematization of the training.

#### **VII. The principle of active participation in training**

The principle of active participation in training means not just the athlete's physical effort, but their mental, moral and spiritual participation as well. The basis for this principle can be found in pedagogy and sports-ethics, the sports-philosophical concept of the responsible athlete (Lenk, 1979). Ethically, philosophically and morally the athlete must be responsible for his or her training as they are ultimately the ones concerned. This is a requirement for competitive athletics in our society, given the values our society professes to hold. This must be particularly true for a sport where the athletes are so young and which also professes to a pedagogical mission. In addition, active participation should yield better results from a given training load than rote repetition or unconscious activity, teaching methods that have been condemned in pedagogy for some time.

Obviously, active participation can only be expected of individuals who are informed of what they are doing, why and for how long, where they are coming from and supposed to go. This pre-

supposes a certain cultural equality between athlete and coach. Such equality is difficult to achieve given the complexity of the gymnastics training content and the immaturity of the athletes. However, here the affective and cognitive training of the athlete can play a central role. As far as level of insight, the coach and athlete must be able to communicate, to share a common understanding of key terms and concepts in training and biomechanics. The "dumb jock" has little or no opportunity for success in today's gymnastics.

This principle is closely connected with the principle of variety in the training. Variety is a means of promoting the athlete's interest and involvement in his or her training. Monotony reduces the athletes active interest in their own destiny.

The implementation of this principle seems to be extremely problematical in gymnastics due to the immaturity of the athletes. Although why this should be the case is not clear. There should be no problems in the coach changing hers/his role from that of dictator, to comrade to resource person during the course of the gymnast's career. The potential gains in training effectiveness and creativity from the athletes active participation are great.

#### **VIII. The principle of multilateral development**

The prerequisites for successful gymnastic performance are of such breadth and scope that gymnastics itself is considered a key element in the multilateral development of all athletes. Bompa (1990, p. 12) mentions that the previously socialist countries of Eastern Europe used gymnastics, track-and-field and swimming as cornerstones of their general physical education. However, it is debatable whether even gymnastics by itself can assure sufficient multilateral development. It is the opinion of Soviet and East-german sports scientists that this is not the case. Specialized development of the coordinative capacities of the

gymnast are necessary (see Tschurbaew, 1989).

This principle should not be understood as encompassing any activity without discretion. The gymnast's multilateral development, over career, macro-, meso- and microcycles, is oriented towards a dynamic correspondence with gymnastics. There is a specificity in the multilateral development. In particular for gymnastics, which places such high demands on the coordinative motor capacities: learning, control and adaptation, multilateral development has a central role in the development of the coordinative capacities.

#### **IX. The principle of specialization**

It appears that it is the official, if unstated, policy of the FIG to combat specialization within gymnastics. In fact, the compulsory exercises often seem to select elements when they become rarely chosen for optional routines. The epitome of competitive gymnastics is still the champion of the all-around competition (all events, compulsory and optional routines). It must be admitted that championships are held for individual events and that there is movement to increase the prestige of these championships.

Nevertheless, gymnasts are gymnasts: highly specialized athletes. The existence of optional exercises permits the coaches and choreographers to highly specialize the gymnast's routines based on perceived skill strengths and weaknesses.

The principle of multilateral development and specialization are not opposing but complementary aspects of the same process. Multilateral development permits a profound motor, morphological and psychological specialization of the athlete (Harre et.al., 1982). Without the preceding multilateral development, the developmental potential of the athlete is curtailed in a number of ways.

#### **X. The principle of individualization**

Gymnastics training is highly individualized on the level of composition of optional routines. The coach and choreographer will try to select skills and compose combinations and routines that show the judges the athletes strengths while hiding the perceived weaknesses.

On the level of the compulsory routines, the training is hardly individualized. There is a prescribed ideal performance of the routines by the Code of Points that all athletes must attempt to attain. The compulsory routines are used as powerful control factors to influence the development of gymnastics and groups or classes of gymnasts.

The individualization of the gymnasts training is rendered particularly difficult because of a lack of performance norms. Therefore it is difficult to identify individual weaknesses or strengths, and adjust the training content accordingly. What is more, the lack of norms makes it difficult to know when an athlete is adequately prepared to learn a certain skill. If this were possible, the learning process could be much more successful, efficient and safer.

#### **XI. The principle of variety**

Perceived variation in the training is a function of number of alternative training forms and the training volume. As the number of alternatives increases, variety improves. As the training volume increases with a constant training content, training monotony increases.

Due to the exceptional breadth of content of the training necessary to perform well, a systematic variation in the training is almost self-evident. This is despite the extremely high training volume. The practice of a double-periodization of the annual plan increases the frequency of change of training content and thereby variation.

The principle of training variety is intimately connected with the principle of the active participation of the athlete. Monotony reduces the athlete's active involvement in the training process. Variety improves active participation.

A significant aspect of gymnastics training is the learning of new skills, stabilization of those skills, incorporation of such skills into combinations of skills and routines. The process of learning is not repetition by rote, but must be considered as practice without repetition (Bernstein, 1967, p. 134). Hence a systematic variation of technique training goals, means and methods is

essential for successful skill training, and thereby gymnastics training. It seems likely that one of the causes of breaks in competitions by even well-prepared gymnasts is to be found in the stereotyped repetition of routines, over-stabilization of performance and insufficient variable availability (Meinl, 1980; Matveyev & Novikov, 1982).

There can be no question that creativity to create variety must be an essential part of the methodology of the training process in gymnastics. Matveyev and Nowikow (1982) observe that, "The path to top athletic performance cannot be separated from creative searching. A new athletic performance is always more or less a discovery. The discovery of new ways of exploiting the possibilities of the athlete; new training methods. Therefore, not just a simple conscious attitude towards things is required from the athlete, but instead an extremely deep engagement in its being; not just activity but continual, creative initiative." Specifically for gymnastics, one must approach gymnastics training with a creative attitude, searching for the most effective ways and means for development. This is because even recommended exercises can have insufficient effect and therefore must be traded for others. The dosage of the exercises in series and time-span can also be individual. Therefore coaches must free themselves from mechanical imitation of well-known training methods, be creative and try out ways and processes that permit development while using less training time (Menchin, 1972, p. 280).

#### **XII. The principle of modeling the training process**

In gymnastics training one must differentiate between informal and formal models. Both exist in the sport and are equally wide-spread.

The model of the conditioning-skills-combina-

tions-routines-competitions-vacation sequence is well-known. W. Smolewskij (1978) has presented what is essentially the system in the old Soviet Union today. The cybernetic character of the model is readily apparent. This model was discussed under the heading of the principle of systematic training. It appears that the best models are self-regulating, feedback models.

Obviously, the functional characteristics of the model will be determined by the socio-economic and political context in which the training takes place. For example, gymnasts in a capitalist, free-market society will learn skills differently than in a centrally planned, communist society. The gym exists within society as a whole and the coaches and gymnasts are also part of that society. Each social system must find it's own best models and systems. Model development and refinement is a central responsibility of the professional gymnastics coach.

The specific preparation of the gymnast will involve training models that specifically mimic certain aspects of the competitions. Such models will mimic the apparatus, the judging, the noise of the crowd etc.

#### **XIII. The principle of the progressive increase in training load**

The career of the gymnast should be exception-

ally long, resulting in high training ages, even in younger athletes. This is necessary in order to accomplish the wide extent and variety of training necessary to tackle the breadth of demands gymnastics places on the athlete. Therefore the first expression of the principle of the progressive increase in training load in gymnastics can be seen in the precocious increase in training volume. As increases in performance potential are closely connected with increases in training demands in gymnastics, increases training load and performance will be closely associated.

Relatively soon in the gymnast's career, training volume will have attained a practical maximum. Further increases in training load, necessary for continued development and improvement, can only be achieved by changes in other parameters of the training load: training intensity, density and content. In practice, gymnastics training load is increased by the periodization of the training content. While the volume and even the intensity of the training can remain essentially the same, the training content changes from general conditioning to increasingly specific routine training.

## Conclusion

The principles of training are guidelines for organizing and planning a very complicated process: the preparation of an athlete for competition. These principles have been compiled from the experience of successful coaches, sports-scientific research and logic. Gymnastics training can benefit a great deal from these guidelines.

Every training program must be measured against the principles of training. By seeing how the plan measures up on each point, every plan can be improved and the confidence of all the participants increased. A good plan is not the execution, the proverbial blood, sweat and tears, but it is the best beginning.

Matveyev, L. (1981). *The Fundamentals of Sports Training*. Moscow: Progress Publishers

Matveyev, L., Nowikow, V. (1982). *Theorie und Methodik der Koerpererziehung 2*. [The theory and methodology of physical education, vol.2] Berlin: Sportverlag

Meinl, K. (1980). *Bewegungslehre* [Kiniseology]. Berlin: Volk und Wissen

Menchin, J. (1972). *Das Krafttraining des jugendlichen Turners*. [The strength training of the young gymnast]. In Lukjanov, Falmeyov & Menchin (1972) *Gewichtheben fuer Jugendlichen / Das Krafttraining des jugendlichen Turners*. Schorndorf: Verlag Karl Hofmann

Sands, W.A. (1984). *Coaching Women's Gymnastics*. Champaign: *Human Kinetics*.

Sands, W.A. (1991). Monitoring the Elite Female Gymnast. *Journal of the National Strength and Conditioning Coaches Association* 13(4)

Sands, W. A., & Major, J. A. (1991, Sep 12). The time course of fitness acquisition in women's gymnastics. *FIG Scientific/Medical Symposium Proceedings*, 1, 9-13.

Sands, W.A., Henschen, K.P. (1992). The Probability of Repeating on World Championship and Olympic Teams for U.S. Women's Gymnastics: a Twenty-Three Year Retrospective Look. *U. S. Gymnastics Technique*, 12,(2)

Sands, W.A. (1992). *ESS569 Training Theory and Periodization*. Salt Lake City: University of Utah

Smolewskij, W. (1978). *Training im Kunstturnen der Hochleistungsklasse als langjaehriger Steuerungsprozess* [Elite gymnastics training as a long-term control process]. *Leistungssport*, 1978(5)

Stark, G. (1984). *Sporttechnisches Training und zwei grundlegende Prinzipien der Leistungsentwicklung* [Sport technique training and two basic principles of performance development]. In *Theorie und Praxis des Leistungssports*, 22, 3-12

Tscherburajew, W. (1989). *Ausbildung koordinativer Faehigkeiten* [The development of coordinative capacities]. In U. Goehner (Ed.), *Leistungsturnen im Kindesalter*. Symposiumbericht. Stuttgart: FIG and Organisationskomitee Weltmeisterschaften im Kunstturnen Stuttgart 1989.

Ukran, M. (1975). *Methodik des Turntrainings*. [The methodology of gymnastics training]. Schorndorf: Verlag Karl Hofmann.

## References

Bernstein, N.A. (1967). *The control and regulation of movements*. Cambridge: Pergamon Press.

Bompa, T. (1990) *Theory and Methodology of Training*. Dubuque: Kendall/Hunt Publishing

Farfel, W.S. (1980) *Bewegungssteuerung im Sport*. [The control of movements in sports] Berlin: Sportverlag

Gadjos, A. (1983) *Lehrbuch des Geraet- und Kunstturnens*. [The textbook of apparatus and artistic gymnastics]. Schorndorf: Verlag Karl Hofmann

Harre, D. et.al. (1982). *The Principles of Sports Training*. Berlin: Sportverlag

Lenk, H. (1979) "Muendiger athlete" und "demokratisches Training". ["The responsible athlete" and "democratic training". Explanation for a training concept.]. In Gabler, H. et al. (1979) *Praxis der Psychologie im Leistungssport*. Berlin: Verlag Bartles & Wernitz.

Magill, R. (1989). *Motor Learning. Concepts and Applications*. Dubuque: Wm. C. Brown Publishers

Martin, D. (1977). *Grundlagen der Trainingslehre, Teil I*. [The Foundations of the Theory and Methodology of Training, Part I.] Schorndorf: Karl Hofmann Verlag

Martin, D. (1980). *Grundlagen der Trainingslehre, Teil II*. [The Foundations of the Theory and Methodology of Training, Part II.] Schorndorf: Verlag Karl Hofmann

Werchoschanskij, J. (1985). *Effectiv trainieren*. [Effective training]. Berlin: Sportverlag.

### Solution to Crossword Puzzle from page 32

		S	H	O		J	A	C	K	I		
M	O	T	I	F	F	S	P	A	C	I	N	G
A	N	Y	T	O	L	S	E	D	A	T	E	S
S	E	E	K	G	E	T	S	E	T	G	E	M
A	B	S	U	R	D		O	S	H	O	L	E
A	R	A	R	E	I	R	E	T	Y	S	O	N
B	A	R	T	C	O	N	N	E	R	T	V	S
I	S	E	T	O	U	S	A	M	I	A	E	E
E	H	O	H	A	S		M	E	G	P	R	E
A	T	W	O	B	A	G	O	R	B	U	S	T
K	O	R	M	A	N	N	U	G	Y	M	E	E
I	N	E	A	S	Y	P	R	E	P	P	E	N
D	I	D	S	E			S	P	S			