Physical Education and Sports

Kapil Goyal

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VIDYA BOOKS

<u>Contents</u>

Chapter 1

Sports Training: An Introduction

BASIS OF SPORTS TRAINING

All activities which are part of human behaviour were subject to a long-term development. Let us take throwing, which is regarded a basic motor activity, as an example. In the deep past, throwing was necessary for feeding and defence. At present, throwing has lost its importance as one of the above mentioned activities but it is involved in different sports to a great extent (*e.g.* athletics, handball, baseball, etc.). The task of a prehistoric hunter was to hit the target precisely to get food. The aim of a present-day athlete is to throw the javelin as far as possible. The result of the activity in both examples can be considered a performance. Performance is understood as an extent to which motor task is accomplished. With the prehistoric hunter, performance is evaluated dichotomically: hitting the target or missing and it is not restricted by any rules. In the case of the athlete, performance is evaluated following rules of the sports discipline which were set in advance, it is expressed by the length of the throw and is understood as a sports performance. An ability to achieve a given performance repeatedly is referred to as efficiency.

The aim of sports training is to achieve maximum individual or team efficiency in a selected sports discipline limited by rules.

Reaching maximum efficiency in any activity is not possible over a day. Efficiency is conditioned by several interrelated areas.

Sports training focuses on reaching maximum efficiency in motor abilities connected to a certain sports discipline. Supposed performance depends on motor ability and motor skill which are closely related to the sports discipline. Motor abilities can be described as relatively stable sets of inner genetic presuppositions needed to carry out locomotive activities. They include force, speed, endurance, coordination and flexibility. Motor abilities are manifested on the outside by sports skills. Sports skillsare presuppositions needed for implementing performance in a selected sports discipline which is limited by rules. Such presuppositions are gained through motor learning. It, however, would not be possible to implement sports skills or develop locomotive abilities without motivation. Motivation is understood as an inner incentive to carry out certain activity. The final area needed for performance implementation is represented by tactical skills.

Tactics means conducting a sports competition in a purposeful way.

The contents of sports training consists of individual key areas which are called components of sports training:

- Physical component is generally focused on developing motor abilities.
- Technical component focuses on acquiring sports skills through motor learning.
- Tactical component focuses on acquiring and further development of different ways to conduct sports contest on a purposeful basis.
- Psychological component is focused on improving the athlete's personality.

Example: Component of physical fitness means motor abilities which are a condition for maximum jump height. What is crucial in this matter is quick force. In volleyball, technical component is an acquired skill of offensive hit. Tactical component is represented by choosing direction and force of hit which depends on game situation analysis. Psychological component is manifested on the outside by the player's reliance on him/herself to solve game situation successfully. Sports training is understood as a process of systematic development of each component in dependence on

the duration of preparation which leads to achieving maximum efficiency in senior age within the selected sports discipline.

CHARACTERISTICS OF SPORTS TRAINING COMPONENTS

PHYSICAL COMPONENT

Physical component is primarily oriented towards systematic development of motor abilities and their manifestation through sports skills in a selected sports discipline. Among the most important areas of motor abilities are the following:

- Force abilities.
- Endurance abilities.
- Speed abilities.
- Coordinative abilities.
- Flexibility.

Basic differentiation of motor abilities is not sufficient to describe the manifestation of individual abilities within the specific sports discipline. Physical requirements on the athlete during physical training are primarily related to the selected sports discipline. Some sports require carrying out motor activity with a high (*e.g.*, 400-m run) or low (*e.g.*, marathon run) intensity during the whole course of motor task.

Other sports, like soccer or basketball require the athlete to carry out different types of motor activity ranging from static positions to running with maximum speed, often accompanied by change of direction; and all that with a different intensity. Requirements of individual sports disciplines are related to physical capacity of the athlete and can be divided into following categories:

- The ability to develop a high power output in single action during competition such as kicking in soccer an jumping in basketball (force).
- The ability to perform prolonged exercise (endurance).
- The ability to sprint (speed).
- The ability to exercise at high intensity which are the basis on acceleration, maximum velocity and multidirectional change of movement (agility).

Well-designed training programmes are based on applying five principles during each stage of sports preparation. There are three basic principles: specificity, size of adaptation stimulus and progression.

Specificity

Sports preparation in a specific sport is characterised by specificity. The athlete improves his or her performance in specific activities which are the content of a specific sports discipline. For instance, take-off in attack strike in volleyball is characteristic for taking off from both feet, therefore while training quick force, specific exercise must be utilized which support the respective type of take-off.

Size of Adaptation Stimulus

Applying optimum and adaptation stimulus means applying smaller size during sports preparation than the one which the athlete is used to. However well the training programme may be designed, without applying optimum adaptation stimulus, it restricts the ability of the athlete to improve. Subliminal stimulus does not lead to desirable progressive changes in performance.

Progression

If systematic training is to lead to ever greater improvement, its volume and intensity must continuously increase. If the principle of progressive increase is applied properly, it lead to cumulative training effect (an example of this can be gradual increase in intensity of sports preparation by increasing the number of weekly trainings, increasing repetitions within each exercise, change of type or difficulty of exercise).

Technical Component

Technical training focuses on acquiring, keeping and transferring motor skills. Generally, from the point of view of sports training, motor skills are divided into two groups:

Fundamental skills are based on natural ontogenetic development of a human. It includes gait, run, jump, climbing, and basic over arm throwing etc. Sports skills are based on

contents of a specific sports discipline. In volleyball, the content of skills is for instance setting, reception, block, service etc. The aim of developing these skills is acquiring high level of automatisation. These skills accompany the athlete during the whole period of his sports career regardless of the performance level he or she is at.

The athlete keeps such skills for the whole of his sports career regardless of performance level. Acquiring these skills should be in compliance with long-term conception of sports training. According to this conception, training of a specific sports discipline must contain another large group of motor skills which do not form its contents but are important for reaching other aims of sports training.

For example, they include gymnastic or athletic skills which are important for recovery, compensation and versatile development of an athlete. Movement skills can be classified according to three basic motor behaviour criteria.

General Versus Special Skills

General agility tasks targets the development of one or more basic coordinative abilities, whereas special tasks unify them in a skill specific manner.

For example, standing on one foot represents an example of a general skill which develops static balance. On the other hand, standing on one foot on a balancing bar can be a part of a gymnastic set where it represents a special skill.

Closed Versus Open Skills

Closed agility skills have programmed assignments and predictable or stable environments. An example of a closed skill can be gymnastic routine or set in figure skating. Open skill have non- programmed assignments and unpredictable or unstable environments. The context changes during performance, and the training objective is to rapidly respond and adapt to new or unforeseen stimuli and situation.

An example of a open skill can be situation in games when a defence player must respond to unforeseen movement of the opponent.

CONTINUOUS VERSUS DISCRETE VERSUS SERIAL SKILLS

Continuous tasks have no identifiable start or finish. An example can be skills of cyclic character (cycling, skating, and rowing) Discrete tasks have a definite start and finish. An example can be skills of acyclic character (throw, jump). Serial tasks are composed of discrete skills performed in sequence, with successful execution of each subtask determining the overall outcome. An example can be skills of a combined cyclic and acyclic character (javelin throwing, long jump).

Tactical Component

Tactical component of sports training focuses on different ways to conduct sports competition towards victory. Key terms of this component are strategy and tactics. Strategy means a plan which was created beforehand and is based on experience with a purposeful conduct of sports competition that has proved to lead to an expected result in a specific competition.

Tactics means practical execution of strategy in a specific race situation. Practical execution is based mainly on acquired possible solutions of specific race situation. Progress of acquiring possible solutions of race situations must be in compliance with the duration of sports training within the selected long-term conception of sports training.

Almost every volleyball team has some weakness which can be used as advantage for the opposing team. Let us suppose that the line-up of some anonymous team includes a player who is not so good at receiving of first hit on their half. At present, reception is a necessary basis of a good quality game in volleyball.

Let us further imagine that this team has got a very good setter. Strategy is then based on the fact that it is necessary to aim service at this player in the course of game and attempt to lead own offence over such part of the net that is defended by a player of a lower height.

Tactics is then based on practical solution of game situation when service is aimed in such a way so that the receive spiker view of the ball is made difficult. In such a situation he would have to make as long movement as possible towards the place of reception; offence is conducted according to the position of a

specific defence player, etc. Another example of strategy could be summarised as follows: The basis of own good quality game is to make opponents argue with one another. Tactics is then to choose one of the opponents who is a bit choleric a talk to him at the right moment.

Psychological Component

Psychological component focuses on positive influence on the athlete's personality as far as fair play is concerned in dependence on the length of sports training with the aim to achieve maximum efficiency in senior age.There are no two exactly identical people in the world. Everyone is an original who acts as an individual on the outside. Personality of each individual is characterized by a number of factors. Among them, there are the following:

Temperament which is manifested on the outside through emotions and is related to the dynamics of mental processes. In practice, four basic types of temperament are distinguished: sanguine, choleric, phlegmatic, and melancholic.

Motivation is understood as an incentive which supports some kind of behaviour and is decisive in the kind and intensity of a person's acting. Acting can be described as an activity carried out to follow a clear-cut aim. Motivation is closely related to activation level.

Activation level can be described as the level to which organism is activated. Relationship between activation level and sports performance has been proved to exist. The curve of dependence is in the shape of inverted U. The interpretation is that both very high and very low activation level is of a negative influence on sports performance.

Qualities of an individual are innate and can be divided into two positive (devotion, persistence) and two negative (dependence, selfishness) categories. Qualities of an individual are characterised with four dimensions: direction, intensity, scope and duration.

Attitudes are – as opposed to qualities – acquired and they are repeatedly manifested in given situations. Attitudes originate from echoing, maturing, rationality or on the basis of emotional reactions.

An example of temperament manifestation in sports can be a response of two different volleyball players to a game situation in which the referee makes an unintentional discriminating mistake against one of the teams. Each volleyball player knows that referees never change their statements. A phlegmatic player who does not get emotional easily and does not manifest his or her emotions much on the outside, will not comment on the referee's mistake much, rather he or she will get ready for the rest of the game. A choleric player, who gets emotional easily and manifests his or her emotions on the outside, will comment on the situation violently and will request a change of the referee's decision.

During my career as a coach, I encountered many cases of insufficient or, on the other hand, exaggerated motivation. Neither of these leads to a good performance in competition. It is necessary to keep activation level at an optimum level. It is upon the coach's feeling and experience to know how much motivation his trainees need to reach maximum sports performance. The following rule holds true: "neither too much, nor too little".

Both positive and negative qualities are manifested in any situation. In sports, these qualities are manifested much more in situations when the athlete or the team loses. Again, it is upon the coach's feeling and experience to be able to regulate these manifestations in the right way.

What can be used as an example from the area of sports is a team of athletes of a senior category of a high-league collective sport who considered training of physical fitness useless. It was very difficult to begin with fitness training. The athletes' attitudes towards fitness training changed with first successes. Now, the attitude of nearly all the athletes is totally different. For a well physically prepared athlete is able to resist fatigue more effectively and consequently manifest better performance. Tasks of sports training focus on systematic development of the components of sports training. Development of individual components of training is influenced by the structure of sports performance.

STRUCTURE OF SPORTS PERFORMANCE

Sports performance is understood as an extent to which a motor task limited by rules of a given sports discipline is

accomplished. Sports performance factors are understood as a relatively independent part of sports performance. Traditionally recognized factors of sports training in any sports disciplines include:

- Somatic factors
- Fitness factors
- Technical factors
- Tactical factors
- Psychical factors

A common feature of the factors is that they can be affected by training (fitness, technical, tactical, and psychical) or they are taken into account in talent picking (somatic – *e.g.* selecting taller children for volleyball, basketball, or shorter for gymnastics respectively).

Sports performance factors correspond to the above sports training components. Sports performance is influenced by a number of factors. The importance and hierarchy of the factors depends on a specific sports discipline.
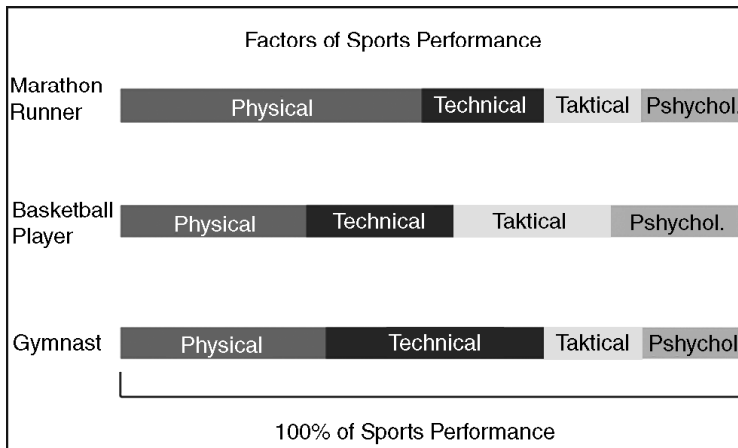
Fig. Example of sports performance factors in different sports discipline

For marathon runners, long-term endurance training is an important part of the year's micro cycle, while with sports gymnastics development of this kind of endurance is not a priority.

Model of factors determining sports performance is presented here as an example.
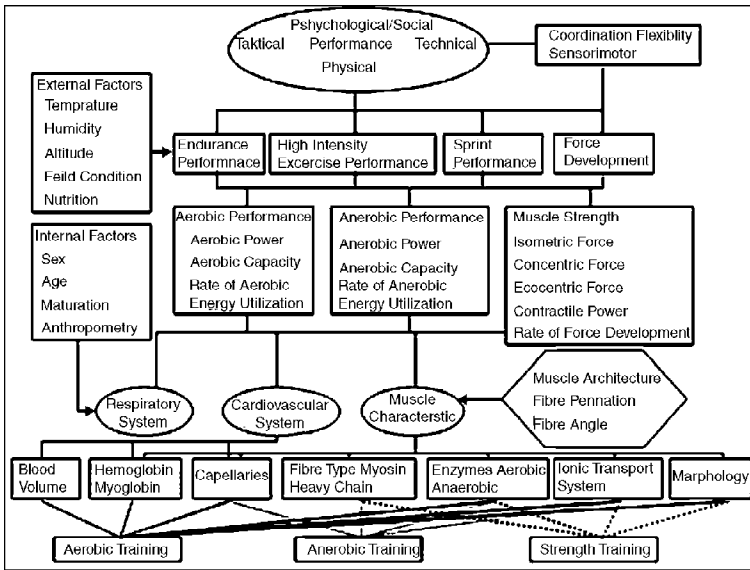
Fig. Example of sports performance factors.

The performance of an athlete in sport depends on the athlete's technical, tactical, physical, and psychological-social characteristic. These factors are linked with each other, *e.g.*, the technical skills can not be fully utilised without adequate levels of physical abilities. Conversely tactical component can not be fully utilised without adequate quality of technical skills.

The physical demands in sport are related to the activities of the athlete. The performance in selected sports discipline is based on the characteristic of the respiratory and cardiovascular systems as well as muscles, combined with the interplay of the nervous system.

The muscular system is constituted by a multitude of components, which have important influence on the mechanical and metabolic behaviour of the muscle. Muscle morphology and architecture, and myosin isoform composition play a major role in the contractile strength characteristics of the muscle evaluated as maximal isometric, concentric, and eccentric contraction force, maximal rate of force development, and power generation. Glycolytic muscle enzyme levels and ionic transport systems are major determinants of anaerobic power and capacity. Likewise,

mitochondrial enzyme levels and capillary density exert a strong influence on aerobic muscle performance in turn affecting the force development and the maximal power output of human skeletal muscle, while also influencing the endurance performance of the muscle fibres. The respiratory, cardiovascular, and muscle characteristic are determined by genetic factors but they can also be developed by training. A number of environmental factors such as temperature and for outdoor sports, the weather and surface of competition ground also influence on the performance.

Chapter 2

Training Methods

METHODS OF TRAINING - THE RIGHT METHOD

OBJECTIVE

To inform participants of the methods of training available to them, with particular attention given to the lecture, the lecture/discussion, the skill lesson and the on-the-job session.

Suggested Methods of Instruction

- Lecture
- Discussion
- Demonstration
- Exercise

Aids

- Overhead transparencies
- Demonstrations
- Handouts

Time Frame

- One hour lecture/discussion
- One hour of five-minute mini-lectures

Content

- The different methods of training
- Selecting the right method

- The lecture
- The lecture/discussion
- The skill lesson
- On-the-job training (the four-step method of instruction)

Approach

This module lends itself to a lively presentation by the trainer. The trainer must be capable of demonstrating personally the methods of training selected for special attention. These methods are believed to be the most appropriate for use in training in food control practices including GMPs and HACCP. It is acknowledged that case studies also have their use, but considerable time is required in their preparation. The trainer should spare no effort to make this module effective. The methods are the tools the trainees will use when they became trainers. It is essential that the presentation of the module provide them with a base for effective training, on which the trainees can build by practising to improve performance.

Exercise

Ask participants to give a five- to seven-minute mini-lecture on a subject of their own choice that is related to food quality control. Instruct the participants to prepare a point outline on the subject of their lecture for use during their presentation.

The Different Methods of Training

You have a choice of the following methods to prepare for effective training:
- Lecture
- Lecture/discussion
- Skill lesson
- On-the-job training (the four-step method)

There are other methods of training, but their effective use is specific to special training situations and will not be discussed in this lecture. Some of those methods include:
- Role play
- Assignment
- Case study

- Training games
- Group exercises
- Programmed learning

Selecting the Right Method

All the resources at your command must be used to make your instruction real and vital for your trainees. The number and types of training methods you use during any presentation depend on many factors, and you must therefore have answers to the following questions before you decide how you will present your material.

- What is the ability and level of knowledge of the group?
- How many trainees are in the group and why are they there?
- How much time do you have to prepare your material?
- Can you cover your topic fully in the time available?
- What aids do you require?
- Do you have the experience to use these aids with confidence?
- Are you aware of the limitations of aids?

Your method of presentation will depend on the answers to these questions.

On-the-job Training (The Four-step Method Of Instruction)

Step 1
- Prepare the worker
- Put the worker at ease
- State the job and find out what the worker already knows about it
- Stimulate the worker's interest in learning the job
- Place the worker in the correct position

Step 2
- Present the operations
- Tell, show and illustrate one important point at a time
- Stress each key point
- Instruct clearly, completely and patiently, but teach no more than the worker can master

Step 3
- Try out the worker's performance
- Have the worker do the job, and correct errors
- Have the worker explain each key point to you as he or she does the job again
- Make sure the worker understands, and continue until you are certain of this

Step 4
- Follow up
- Put the worker on his or her own
- Designate to whom he or she should go for help
- Check frequently
- Encourage questions
- Taper off extra coaching and reduce follow-up

Example of An on-the-job Training Session: Training Workers In the Correct Method of Hand Washing

Workers in fish processing units must maintain a high degree of personal cleanliness. In order to educate the workers in better hygienic practices, the correct hand washing method is one of the topics demonstrated in fish processing units. The main objective of washing hands is to avoid contaminating the material with organisms from the hands. Unwashed hands transmit microorganisms. It is therefore essential that hands be washed thoroughly. The following procedure for washing hands is recommended:
- Wet palms and arms, from the elbow down, with fresh water
- Apply soap
- Work lather on and around fingers, nails and arms from the elbow down
- Rinse palms and hands with fresh water
- Wipe palms and hands dry using a clean towel

THE ART OF QUESTIONING

Objective

To provide guidance to the trainee-trainers on how to ask questions, and to make them aware of the dos and don'ts of questioning.

Suggested Methods of Instruction

- Lecture/discussion
- Discussion
- Handouts

Aids

- Overhead transparencies
- Handouts

Time frame

- One hour presentation

Content

- Importance of questioning
- Types of questions
- Purpose of questions
- How to ask questions
- Preparation of questions
- Dos and don'ts of questioning
- Questions asked by trainees

Approach

This module is of great importance, as skilful questioning is essential to a trainer's effectiveness.

Learning Outcome

The participants should have the knowledge and ability to utilise questioning to support effective training.

MEANING AND CONCEPT OF TRAINING

We would like to present the Pro-Skills training concept as devised by the European project group. We do not offer a standardised training programme. Different groups of socially disadvantaged individuals have very different characteristics and needs which have to be taken into account and with which the flow and design of the training course, selection of the materials and exercises need to be coordinated. This training concept offers a good theoretical grounding as well as guidelines relating to the

goals, content, methods and general framework for a Pro-Skills training course.

TRAINING GOALS

The Pro-Skills training concept aspires to achieve the following with the participants:

- *Motivation*: The training course would like to inspire interest and motivation for lifelong learning in the participant.
- *Human rights*: Participants shall become sensitized for their right to education and equal access to educational offerings.
- *Recognising own opportunities*: Participants will be made aware of the opportunities available to them to further their education and change their life.
- *Taking personal responsibility*: Participants will no longer feel they are guilty and victims of society; they will learn not to accept this role if they have been assigned it by others.
- *Recognising own resources and strengths*: Participants are to recognise their existing resources and strengths and develop ideas as to how they can enhance them and acquire new ones.
- *Acquiring skills*: Participants will actively upgrade their skills and be given the opportunity to experiment with new skills and behaviours in the protected environment of the training course.
- *Self-worth and self-efficacy*: The training course aspires to support participants' sense of self-worth and instil in them the feeling of self-efficacy which is a fundamental precondition for the remainder of the learning process.
- *Empowerment for self-regulated learning*: Participants will be empowered to plan and implement their own individual learning process independently and on their own authority.
- *Equal access to educational offerings*: Participants will be helped to find equal access to formal and informal educational offerings.

TRAINING CONTENT

The specific content of the training course depends on the attributes, needs and prior knowledge of the target group in question. In turn, Pro-Skills offers training modules containing materials and exercises relevant to many and diverse aspects and topic areas.

There follows a description of the three core training modules. In each case, the Pro-Skills toolbox refers to selected materials and exercises that have been collated by the project partners and are deemed to be good practical examples. You are also welcome to contact a project partner in your own country and request additional material in your own national language. As suggested, also be happy to advise you on how to design your own training projects. We would like to point out from the outset that many basic skills are interlinked and that categorising them as personal, social and self-management skills is not always clear-cut.

Personal Skills

What we mean by personal skills is the ability to reflect on and regulate internal concepts and processes such as emotions, cognitions and one's own identity.
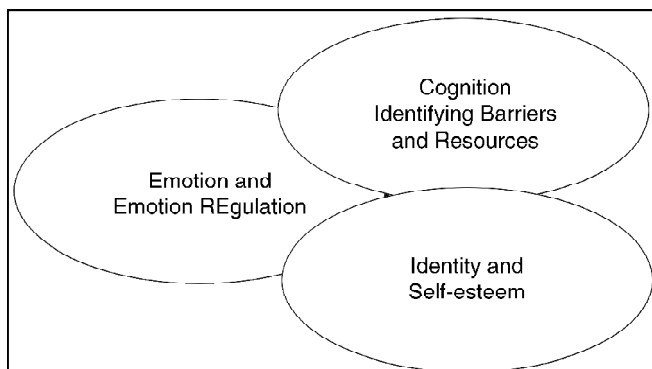
Fig. Personal Skills

Aspects of personal skills are:
- Emotions and emotion regulation: The ability to perceive and express one's own feelings and deal appropriately with them;

- Cognition: Self-reflection, realistic self-assessment, overcoming problems, perception of one's own desires and goals, identifying barriers and resources, goal-setting and decision-making;
- Identity regulation and self-worth, self-confidence and self-efficacy;

Social Skills

Social skills are abilities and behaviours that help to direct the focus of one's own behaviour away from one's own self towards a shared alignment with other individuals. Socially competent behaviour combines the individual's goals with the values and goals of a social group.

Cooperation and Team Skills	Communication
Conflict Management	Relational Group-Dynamic Process
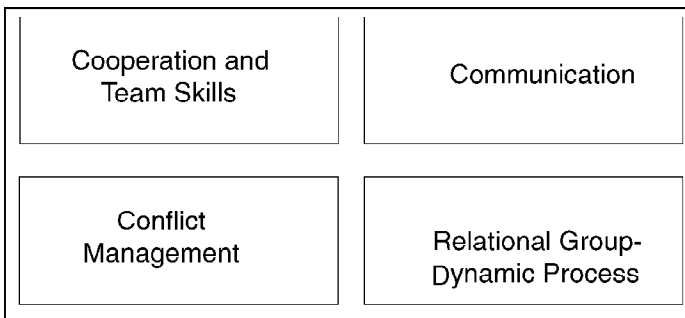
Fig. Social Skills

Aspects of social skills are:
- *Cooperation and ability to work in a team*: Openness and tolerance, sociableness, use of social resources, conducting negotiations, leadership skills, intercultural skills;
- *The ability to communicate*: Language skills, active listening, feedback, empathy, giving and receiving recognition;
- Conflict resolution/the ability to compromise;
- Group dynamic processes.

SELF-MANAGEMENT SKILLS

Self-management skills are crucial to successfully planning and implementing activities. Each activity–if it is done more or

less consciously–is based on a sequence of cognitive and active steps. Psychological theories deal in detail with the cognitive processes.
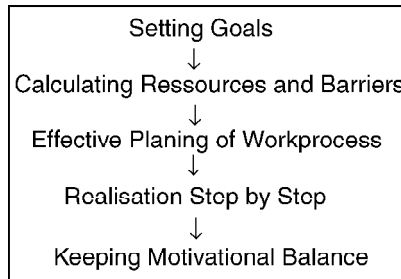
Fig. Self-Management Skills

With regard to learning processes, the following steps can be distinguished:

- *Goal-setting*: The individual must set a specific learning goal. The overriding goal may for example be earning one's living, a higher standard of living or a higher level of educational attainment. What is now needed is to define interim goals en route to the higher-level goal, which in turn requires additional cognitive and active processes to be performed.
- *Calculating resources and barriers*: The individual has to weigh up resources such as time, money, social support and resolve practical problems such as childcare during a training course, reaching the event venue and suchlike. Weighing up resources and barriers can influence which goals are chosen.
- *Effective planning of the project*: The individual develops a sort of work plan as well as a realistic timetable having regard to the resources available and the existing barriers.
- *Step-by-step implementation*: The planned steps of the activity now have to be successfully implemented in the correct sequence. To this end, resources have to be mobilised, obstacles overcome and timetables and deadlines adhered to. In the process, further obstacles and questions may surface which were not previously discernible or had not been taken into consideration. The

individual must respond flexibly to these circumstances when selecting techniques and using resources so as to achieve their interim goals.

- *Maintaining motivation*: Putting the steps the activity entails into practice may take some time and require unforeseen obstacles to be surmounted. To achieve this, the individual requires patience and stamina as well as constant motivation.

CONTINUOUS TRAINING

Continuous training is when low- to mid-intensity exercises are performed for more than 15 minutes without resting intervals. Generally, this type of training is used to prepare the body for longer endurance activities, such as a marathon or triathlon, and allows the body to work from its aerobic energy stores to build muscles.

In contrast, interval training allows the body to rest between periods of activity. Some studies have shown that interval training allows the body to sustain activity up to four times longer than continuous training does. Chief benefits of continuous training include burning fat, building muscles, and increasing maximum aerobic potential.

As with all forms of exercise, the primary benefit of continuous training is general health and fitness. There is some debate as to which type of training method is better for endurance event training. Continuous training, however, does provide measurable results for improving endurance even if it is at a slightly lower performance level. It can improve the cardiovascular system, as well.

Most athletes typically should not jump into continuous training since the body needs to be prepared for this kind of activity.

Someone who is considering continuous training for aerobic and weight loss benefits usually needs to take the current fitness level of the body into consideration. It generally is recommended that an athlete begin continuously training for 12 to 15 minutes and should add two minutes for every week that the exercise routine is maintained. Increasing the duration of the exercise

beyond two minutes can increase the risk of injury. This level of continuous exercise should plateau between 20 and 25 minutes. Once this level of training has been maintained for six or more months, the athlete usually can then consider increasing training. Greater levels of continuous training are generally reserved for long distance runners, cyclists, and swimmers. The athlete typically should focus on the time he or she is spending doing the activity and not the speed of the exercise. By keeping speeds low, the athlete decreases the chance of injury while building the specific endurance related to his or her sport. When continuously training at this intensity, the athlete must still give the body sufficient time to recover, as well.

INTERVAL TRAINING

Interval training is basically exercise which consists of activity at high intensityfor a period of time, followed by low intensity exercise for a period of time. These 'sets' are repeated.

Sprint Intervals

The high intensity portion are called Sprint Intervals. Sprint intervals are measured either by time or distance. They can be as short as 15 seconds in activities like HIIT or as long as 20 minutes for aerobic interval training. An example of a Sprint Intervals would be running at full pace along a stretch of field for 30 seconds, another would be an indoor cyclist spending 15 minutes simulating a climb on the bike.

Rest Intervals

The periods of recovery are called Rest Intervals. During an rest interval athletes do not stop the activity but generally exercise at a low intensity which allows the body to recover from the sprint interval. The length of these rest intervals are determined primarily by your fitness levels and the type of the sprint interval. The intervals are important; the basis of the interval training is to ensure that your sprints are done at an optimal intensity, without sufficient rest your interval training will resort back to an aerobic type of activity.

Intensity

The intensity of the sprint intervals is how hard you push yourself during the sprint. For simplicity sake the intensity is usually measured on a scale of 1 to 10, 1 being no effort whatsoever while 10 represents the maximum effort possible.

Now this is a completely personal scale depending on your own fitness levels and the type of interval training. For example a seasoned athletes may be training on improving his speed work, the sprint lasts for 15 seconds and his '10' may be a flat out sprint with the athlete going as fast as he or she can. Another example would be someone who has not exercised in a while decides to do intervals while walking; a 1 minute walk at a brisk pace may leave the person completely out of breath. This would be their 10. Now take the original athlete who sprinted for 15 seconds and change the interval to 5 minutes. They couldn't maintain the same original 15 seconds pace for 5 minutes, but the maximum effort still represents a 10. A '10' is merely the maximum amount of effort a person can safely expend for that particular interval.

FARTLEK

It has a strange name but this can be one of the toughest workouts you'll ever try. Fartlek cardiovascular training is a form of interval training, or HIIT. It is considered an advanced technique but can be used by anyone. Fartlek conditioning can be applied to any form of cardiovascular exercise, and it is also considered one of the greatest endurance exercises.

Used primarily by long distance runners, Fartlek's training benefits are now being realised in the fitness community as well. Endurance exercises such as Fartleks are an outstanding way to burn up some serious calories while improving your cardiovascular stamina.

This technique can be a great way to increase running speed too, and it is excellent for endurance conditioning. It will also raise your anaerobic threshold, giving you the ability to train longer and harder. How is Fartlek training different? With regular interval training, the participant alternates periods of high and low intensity in fixed time segments. Fartlek interval training differs from other training methods in that there are no predetermined intervals and there is no predetermined pace. It allows you to run at any pace and distance you wish. You stagger high, medium, and low intensities for as long as you like. Combine interval training with your workout routine for a serious 1-2 punch.

This approach can be used outdoors or indoors. While it was developed by runners, you can utilize this technique with your favourite cardio exercise. Of course with this freedom to choose pace, time, and distance you must be conscientious of your level of exertion. You will need to closely monitor your breathing and heart rate. You also need to be honest with yourself to ensure you're working hard enough.

This freedom also allows you to enjoy the training session more. Interval training is more structured and deliberate; whereas Fartlek conditioning lets you explore your own ability level and aerobic capacity. I can assure you that you will not be bored with this type of training.

CIRCUIT TRAINING

Circuit training is an excellent way to improve mobility, strength and stamina. The circuit training comprises of 6 to 10

strength exercises that are completed one exercise after another. Each exercise is performed for a specified number of repetitions or for a set time before moving on to the next exercise. The exercises within each circuit are separated by a short rest period, and each circuit is separated by a longer rest period. The total number of circuits performed during a training session may vary from two to six depending on your training level (beginner, intermediate, or advanced), your period of training (preparation or competition) and your training objective.

Planning

Identify on paper 3 to 4 circuits of 6 to 10 exercise that can be performed with the available resources. In each circuit try to ensure that no two consecutive exercises exercise the same muscle group. *e.g.* do not have press ups followed by pull ups.

The exercise circuit should be set up so that you work each body part as follows: Total-body, Upper-body, Lower-body, Core and Trunk, and Total-body etc. For each circuit I have a set of linoleum squares (6 inches by 6 inches) with an exercise written on each that I lay by the equipment to indicate to the athletes the required exercise at each stage of the circuit. You could use plain card or paper and include an explanation as to how to perform the exercise, duration and recovery.

It is important to conduct a warm up at the start of the session and a cool down at the end of the session.

The following are examples of exercises that can be used in a circuit training session:
- Upper-body:
  – Press ups, Bench dips, Pull ups, Medicine ball chest pass, Bench lift, Inclined press up
- Core and trunk:
  – Sit ups (lower abdominals), Stomach crunch (upper abdominals), Back extension chest raise
- Lower-body:
  – Squat jumps, Compass jumps, Astride jumps, Step ups, Shuttle runs, Hopping shuttles, Bench squat
- Total-body:
  – Burpees, Treadmills, Squat thrusts, Skipping

Example Circuit Training Sessions

Exercises:
- Treadmills, Press ups, Squat Jumps (forward astride), Sit ups (bent knees feet on the ground), Squat Thrusts, Bench Dips.

Exercises:
- Treadmills, Press ups, Squat Jumps (forward astride), Sit ups (bent knees feet on the ground), Squat Thrusts, Bench Dips, Shuttle runs, Back extension chest raise.

Duration:
- 20 to 30 seconds work on each exercise with a 30 second recovery between each exercise.
- 3 to 5 sets with a 3 minute recovery between each set

The duration can be based on time (*e.g.* 30 seconds) or set to half the number of repetitions of the exercise the athlete can complete in 60 seconds of 100 per cent effort. If training is based on the number of repetitions then regular testing (*e.g.* every 4 weeks) will need to be carried out to determine the maximum number of repetitions that can be completed in 60 seconds for each exercise. Training can be based on a four week cycle comprising of an easy week, medium week, hard week and test/recovery week. The workload can be varied by changing the number of exercises, duration, sets or repetitions and recovery time. A selection of upper body, core and trunk, lower body and total body exercises are available on the Circuit Training Exercises page.

Example Programmes

Identify a circuit of 8 0r 10 exercises so that you work each body part as follows: Total-body, Upper-body, Lower-body, Core and Trunk, Total-body, Upper-body, Lower-body, Core and Trunk

Exercise			Circuits	
Week	Work	Rest	Number	Rest
1	20 sec	20 sec	2	2 min
2	30 sec	30 sec	2	2 min
3	40 sec	40 sec	2	3 min
4	20 sec	20 sec	3	2 min
5	30 sec	30 sec	3	2 min

6	30 sec	30 sec	4	2 min
7	40 sec	40 sec	3	3 min
8	30 sec	30 sec	3	2 min

Complete the circuit training session twice a week with at least 48 hours between each session. If you are carrying out other training on the same day then the circuit session should follow, with a suitable recovery period, the other session. The following is an example circuit of ten exercises. Exercise cards could be made up for each station explaining the exercise, duration and recovery.

Chapter 3

Physical Education and Fitness

MEANING AND DEFINITION OF PHYSICAL EDUCATION

Physical Education is the process by which changes in the individual are bought about through movements' experiences. Physical Education aims not only at physical development but is also concerned with education of the whole person through physical activities. It would not be wrong if we say that Physical education is the play-way method of education.

Various Definitions of Physical Education are:

- Barrow defined Physical Education as an education of and through human movement where many of educational objectives are achieved by means of big muscle activities involving sports, games, gymnastic, dance and exercise.
- Webster's Dictionary Physical education is a part of education which gives instructions in the development and care of the body randing from simple callisthenic exercises to a course of study providing training in hygiene, gymnastics and the performance and management of athletics games.
- Jackson R. Sharman points out that physical education is that part of education which takes place through activities, which involves the motor mechanism of human body which results in an individual's formulating behaviour patterns.

- Charles A. Bucher defines physical education, an integral part of total education process, is a field of endeavour which has as its aim the development of physically, mentally, emotionally and socially fit citizens through the medium of physicalactivities which have been selected with a view to realizing these outcomes."
- Central Advisory Board of physical Education and Recreation defines Physical education as an education through physical activities for the development of total personality of the child to its fullness and perfection in body, mind and spirit.

AIMS AND OBJECTIVES OF PHYSICAL EDUCATION

AIMS

The ultimate goal is final end aim of physical education, it the way and achieved some certain objectives. The general education like aim of physical education is to develop human personality in its totality well planned activity programmes. In physical education aim at the all round development of the personality of an individual or some development of human personality and it includes physical, mental, social, emotional and moral aspects to make an individual a good citizen. The physical education means at making an individual physical fit, mentally alert, emotionally balanced, socially well adjusted, morally true and spiritually uplifted.

The objectives of Physical Education are steps considered towards the attainment of the aim and the particular and precise means to realise an aim. An aim is achieved it become an objective in the action that goal on continuing. There some objectives of physical education are the objective of physical fitness is essential to leading a happy, vigourous and abundant life. The second is the objective of social efficiency is concerned with one proper adaptation to group living and all these qualities help a person to make him a good citizen. Another objectives of physical education is culture, it aims at developing an understanding and appreciation of one own local environment as well as the environment and a

person understand the history, culture, religious practices etc and the aesthetic values associated with these activities. So find the best step the ultimate goal in aims of physical education.

OBJECTIVES

Physical education is an important part of every school curriculum and a class every pupil awaits. Physical education is that segment of the daily timetable that every student eagerly waits to attend, as it is the only official time when the students can be on the grounds, engaged in their favourite sports. One of the main objectives of physical education is to bring in this element of joy to the academic orientation of schools. Physical education aims at dedicating a daily time for some physical activity for the students.

The physical training class, as it is also called, involves sports, games, exercise and most importantly, a break from the sedentary learning indoors.

One of the other important objectives of physical education is to instill in the students the values and skills of maintaining a healthy lifestyle. Daily physical activity promotes an awareness of health and well being among students.

It boosts them to engage in physical activities on a daily basis. It promotes them to lead a healthy life in adulthood. Physical education classes constitute programmes to promote physical

fitness in students, train them in sports, help them understand rules and strategies in playing and teach them to work as a team. A very vital factor in physical education is to develop interpersonal skills in children.

Sports aim at making them team players, developing a sportsman spirit in them and enhancing their competitive spirit. Sports that form a part of physical education classes help the students invest time in fruitful and competitive activities. One of the other important objectives of physical education is to inculcate in the minds of the students, the importance of personal hygiene and cleanliness.

Physical education classes aim at teaching the students, the habits of personal cleanliness and the importance of the maintenance of personal hygiene in life. Physical education classes also impart sex-education to the students, help them clarify their doubts and find answers to all the questions that occur to their minds. The sports, which are a part of the physical education class, help in developing motor skills in children. The ability to hold a racket or a bat, the ability to catch a ball and the ability to swing a bat are some examples of the motor abilities that can develop with the help of sports. The physical activity that is involved in physical education helps the students in bringing discipline to body posture and body movements.

Hitting a ball with a bat or a shuttle with a racket as also aiming a ball for a goal or catching it to get the opponent team out, are some of the commonly observed actions in sports and are extremely beneficial in improving hand-eye coordination. The very important objective of physical education is to encourage the upcoming sportsmen and women of the crowd. Physical education gives the budding sports people a platform to exhibit their talents. Those with a flair for sports get an opportunity to display their talent.

Their small step on the school playground can eventually turn into a huge leap in the field of sports. Moreover, sports refresh the students' minds. Physical education class becomes enjoyable for the kids while proving helpful for their overall growth and development. Physical education is indeed one of the most fruitful activities of a school schedule.

NEED AND IMPORTANCE OF PHYSICAL EDUCATION

In the Present World of Space age and automation era, all human beings appear to be living a more and more inactive life. They ride instead of walk, sit instead of stand and watches instead of participants. Such type of inactivity or sedentary life is detrimental to mental and physical health. Thus, there is great need for physical education as a part of balanced living. Physical education which is commonly a part of the curriculum at school level includes training in the development and care of the human body and maintaining physical fitness. Physical education is also about sharpening overall cognitive abilities and motor skills via athletics, exercise and various other physical activities like martial arts and dance. Here are some of the benefits that highlight the importance of physical education.
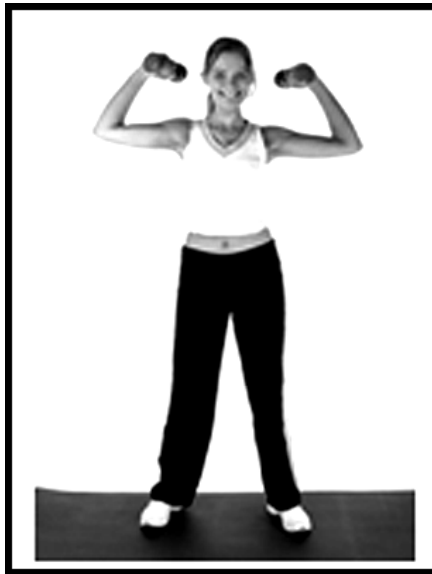
MAINTAINING SOUND PHYSICAL FITNESS

Physical fitness is one of the most important elements of leading a healthy lifestyle. Physical education promotes the importance of inclusion of a regular fitness activity in the routine.

This helps the students to maintain their fitness, develop their muscular strength, increase their stamina and thus stretch their physical abilities to an optimum level. Physical fitness helps to inculcate the importance of maintaining a healthy body, which in turn keeps them happy and energized. Sound physical fitness promotes, increased absorption of nutrients, better functioning of digestion and all other physiological processes and hence results in all round fitness.

OVERALL CONFIDENCE BOOSTER

Indulging in sports be it team sports or dual and individual sports, leads to a major boost in self-confidence. The ability to go on the field and perform instills a sense of self-confidence, which is very important for the development of a person's character. Every victory achieved on the field, helps to boost a person's self-confidence. Moreover, the ability to accept defeat on field and yet believe in your own capabilities brings a sense of positive attitude as well. Thus participation in sports, martial arts or even dance and aerobics, is always a positive influence on a student's overall personality and character and works wonders for his/her self-confidence.

AWARENESS ABOUT IMPORTANT HEALTH AND NUTRITION ISSUES

Physical education classes are about participating in the physical fitness and recreation activities, but they are also about gaining knowledge about the overall aspects of physical health. For example in today's world the problems of obesity, or anemia and bulimia are rampant amongst teenagers. Physical education provides an excellent opportunity for teachers to promote the benefits of healthy and nutritious food and cite the ill effects of junk food.

INCULCATING SPORTSMANSHIP AND TEAM SPIRIT

Participation in team sports, or even dual sports helps to imbibe a sense of team spirit amongst the students. While participating in team sports, the children have to function as an entire team, and hence they learn how to organize themselves and function together. This process of team building hones a person's overall communications skills and the ability to get along with

different kind of people. Thus participating in team sports instills a sense of team spirit, which is a great value addition to anyone's personality and helps a lot in all the future endeavors.

DEVELOPMENT OF MOTOR SKILLS

The ability to concentrate, the ability to swing the racket just at the right time are some of the examples of development of motor skills in the physical education classes. Participation in sports and several physical education activities helps to sharpen the reflexes of the students. It also brings order and discipline to the body movements and helps in development of a sound body posture as well. The hand-eye co-ordination improves as well.

IMPORTANCE OF HYGIENE AND SEX EDUCATION

Physical education classes also include sessions about the importance of personal hygiene and importance of cleanliness. Thus the physical education classes help the students to know the important hygiene practices that must be practiced in order to maintain the health and well being throughout the life.

In addition to this, the physical education classes also cover an important aspect that the children have to deal with at the age of puberty. Physical education classes also impart sex-education and hence help the students deal with their queries and doubts about the subject of sexuality.

ENHANCING OVERALL COGNITIVE ABILITIES

Physical education classes help to enhance the overall cognitive abilities of the students, since they get a lot of knowledge about the different kinds of sports and physical activities that they indulge in. For example a person who is participating in a specific type of martial arts class, will also gain knowledge about the origins of the martial art, and the other practices and historical significance associated with it. Thus physical education helps to enrich the knowledge bank of the students.

ENCOURAGING BUDDING SPORTSMEN

Physical education classes are an excellent opportunity for all the budding sportsmen and sportswomen who wish to make

their mark in the world of sports. Physical education classes allow the budding sportsmen and sportswomen to explore and experiment with several areas until they find what interests them. After this, physical education classes also allow the students to indulge the sport of their choice and then go ahead to participate in several tournaments and competitions, which help to give the students an exposure to the competitive world of sports.

A STRESS BUSTER AND SOURCE OF ENJOYMENT

In addition to the health benefits and the knowledge benefits that the students get from the physical education classes, one important aspect of it remains to be recreation. Students, who are busy with their other subjects in the curriculum, often get exhausted with the listening, reading and writing pattern of studying and need a recreational activity as a source of recreation. Sports and other physical fitness activities offered in the physical education class are a welcome break for the students.

PROMOTING HEALTHY LIFESTYLE IN ADULTHOOD

Children, who learn the importance of health and hygiene in their early ages, tend to grow up to be responsible and healthy adults who are well aware of the benefits of a healthy lifestyle. Thus the overall physical education programme, that includes different types of physical activities and sports and also provides important information about hygiene and overall health, helps in creating well-informed pupils. A well-balanced and all-round physical education class helps to create responsible adults who know the importance of a healthy lifestyle.

PHYSICAL FITNESS

General Fitness: In a more general meaning, physical fitness is a general state of good somatic health and abilities.

A handicapped person may nevertheless be physically fit. Fitness helps them to compensate disability.

Physical fitness is usually a result of regular physical activity, *e.g.*, physical exercise, and proper nutrition.

Cardio is a type of fitness designed to improve cardiovascular strength.

TASK-ORIENTED FITNESS

A person may be said to be physically fit to perform a particular task with a reasonable efficiency, for example, fit for military service.

Military-style

In recent years, Military-style fitness training programmes have become increasingly popular among civilians. Courses are available all over the US and Europe.

They are usually taught by ex-military personnel. Very often the instructors held highly regarded positions within various military organizations. Often times the instructors were formerly Drill instructors, Special Forces Operatives or held otherwise distinguished positions.

These courses always have some common elements. They often focus on military style calisthenics and group runs. The courses are often held very early in the morning and will meet in almost any weather.

Students can expect push-ups, sit-ups, pullups, and jumping jacks, as well as more obscure drills such as flutter kicks, sun worshippers and flares. Almost invariably a workout will include short runs while longer runs are more scheduled. Special forces are renowned for their level of fitness and intensity of their workouts.

Personality Traits

- Sports persons are required to be energetic, enthusiastic and physically fit.
- All professionals in this field must be absolutely committed to the profession and the game.
- Coaches and instructors have several years of experience and training.
- Patience, perseverance and a sporting spirit are required to excel.
- In allied areas of work, communication and business skills are gaining importance and value.
- A sportsperson's work needs psychomotor and physical conditioning.

Courses/Training

Courses:
1. Class XII-any subject with physical education.
2. Graduate degree in Physical education; Postgraduate degree in Physical education. Jobs as Physical education trainers/ educators/therapists/coaches.
3. Graduation in Physical Education followed by Post graduation for Trainers and Managers.
4. Graduation/ Post graduation in Physical Education and B.Phy.Ed for teachers.

Admission Procedure: Sports can be pursued at any age, hence the trajectory gives information on the schemes for promoting talent. Sports talent can be spotted at the school level. The Sports Authority of India has been constituted at the National level to encourage and develop acumen in sports. SAI has State level branches to organise, manage and conduct a host of schemes intended to promote sports facilities and assistance for the talented. Sports Authority of India (SAI) is responsible for training coaches, R&D in sports, physical education, R&D in physical education, sports promotion, nurturing talent, and training of athletes.

1. *Age 9-12 National Sports Talent Scheme:* Talent in swimming, athletics, gymnastics as well as ball and net games which include tennis, hockey, basketball, table tennis, football, volleyball, badminton and wrestling are supported under this scheme. Students in the 9 to 12 age can qualify tests conducted by the Sports Authority. The tests check general and specific physical skills required for each of the disciplines. Selected students undergo sports training along with school education in one of the SAI sponsored schools. The sponsorship includes all expenditures including tuition fee, boarding, lodging, incidental expenditures, sports kits maintenance allowances, medical facilities, travel etc. Coaches provide the necessary training to students selected under this scheme, conduct evaluation tests and maintain performance records.
2. *Age 16-20 years Students:* Can benefit from the Hostel scheme in sponsored institutions. Special Area Games

Schemes operate for identifying and nurturing talent from all regions in the country.

3. *Army:* Regimental training centres have schools where students with sporting talent from neighbouring areas are enrolled. Education, training in sports, and military training completes the curriculum.

4. *Scholarships at Colleges/universities:* Students participating in national championships, inter-university tournaments are eligible for the Sports Talent Scholarship awarded by the Government of India, Department of Youth Affairs and Sports. Candidates are selected on the basis of merit, ascertained by a duly constituted Selection Committee.

5. *Private Sponsorships:* SAI has six regional sports centres. Coaching facilities in popular sports such as badminton, tennis, hockey and cricket are provided. The facilities provided are of international standards. Special Sports Academies/Federations provide similar facilities. These are often privately sponsored and sportspersons with proven talent are supported by these academies.

SOCIAL EFFICIENCY

The development of desirable standards of behaviour and the ability to get along well with others.

The term *social efficiency* indicates those traits usually included in the concepts of character and personality. It has a definite social implication, since in our democratic society the effect of one's actions upon others is of primary concern. An individual's social behaviour is dependent upon: (*i*) individual traits, such as courage, initiative, morality, perseverance, integrity, and self-control; (*ii*) group traits, such as sympathy, courtesy, loyalty, and co-operation; and (*iii*) their interaction for the common good. *A socially efficient individual is one who functions harmoniously within himself, in his relationship with others, and as a member of the society of which he is a part.*

Individuals vary in social characteristics and needs as widely as they do in physical characteristics and needs. Effective physical education procedures in this area should include the identification

of boys and girls with personality conflicts, undesirable character traits, or anti-social tendencies. It is important that such an individual be located early—while his condition is in its incipient stages. The possibility of successful treatment through physical education and other processes is, thus, much greater. For handicapped individuals, resocialisation and personal psychological adjustment can be greatly enhanced through developmental and adapted physical education.

Culture

The enrichment of human experience through physical activities that lead to better understanding and appreciation of the environment in which boys and girls find themselves, and the development of recreational competency for leisure.

In this interpretation, culture is interpreted broadly as "one's stock of appreciations," including all aspects of living that will improve one's understanding and enjoyment of people and events in his civilization. Examples from physical education are: the grace, rhythm, and creative expression of the dance; a biological and aesthetic understanding and appreciation of the human body; appreciation of skilled performance; the historical background and cultural associations of many physical education activities.

Physical education is one of the many education fields that contributes to the recreational competency of boys and girls. Many sports such as swimming, tennis, golf, and the like, have value as leisure time activities.

The developmental and adapted physical education service has definite potentialities for the development of the cultural appreciations and recreational competency of handicapped children. Their spectator enjoyment of many physical education activities can be greatly enhanced; they can be taught skills and activities in which they may participate within the restrictions imposed by their disabilities.

Emphasis for Girls: In this report, the objectives of physical education are considered to be fundamentally the same for girls as for boys. They differ, however, in emphasis and in essential motivation. Basic strength is essential for each sex to realize it own purposes: for girls, sufficient strength means effortless bodily

control reflected in poise, grace, and pleasing posture; for boys, adequate strength permits satisfying participation in sports and athletics; for both, minimum strength levels contribute to the efficient functioning of vital processes.

As Dorothy La Salle has so aptly expressed it: "Women has always needed to be fit for the biological and traditional purposes of our society. Child-bearing and rearing require healthy women." Attention to their physical welfare is necessary and is recognised by women themselves, as shown in the findings of Eleanor Metheny at the University of Southern California. Analysing the responses of a random sample of 300 college women at that institution, she found that 68.3 per cent of this favour group believed that they did not have sufficient health to profit completely from the opportunities of university life; and approximately half of them stated they were under some medical and professional care. Among the conditions regarded as unfavourable by these young women were: chronic fatigue, faulty body mechanics, frequent colds, overweight, undesirable mental attitudes, and dysmenorrhoea.

Girls and women need to participate in activities that will contribute to their personal and social growth and adjustment. Social patterns should be developed which "permit women to like being women in fulfilling the various roles our society calls upon them to play—wife, mother, wage-earner, and home-maker." They need opportunities to make friends, to develop democratic conduct and ideals, and to acquire social skills that will add to their popularity and social adjustment. These factors, and others, should be given basic consideration not only in planning developmental and adapted physical education programmes for girls but in providing proper and effective motivation for the participants.

DEVELOPMENT OF THE PHYSICAL FITNESS

The development of the physical fitness of school children is proposed as a fundamental objective of physical education. In the realisation of this objective, standard operating procedure should be the identification of those individuals who are deficient in this basic quality, so that appropriate steps may be taken to improve their condition. The process of insuring for each student a body

that has adequate physical strength and is capable of prolongede effort, without efficiency-destroying fatigue, therefore, should constitute a primary responsibility of the physical educator.

Assuming a body free from organic drains and handicapping defects, physical education is concerned with three basic physical fitness components—muscular strength, muscular endurance, and circulatory respiratory endurance. The construction of tests to measure these components, and others related to physical fitness, has occupied the efforts of researchers in physical education for a century.

During World War II, motor fitness tests, so-called, were developed and used by physical educators in evaluating the fitness status of military personnel.

STRENGTH TESTS

Strength tests, although they do not measure all aspects of fitness as the physical educator views the problem, do evaluate basic elements of the individual's general physical status. They have been used successfully in practical school and college situations as a means of selecting students for Physical Education: Values and Promotion. A great deal of research has been done in this area, dating from 1880.

The strength test most widely used in physical education to select boys and girls who are sub-part in this quality is the Rogers Physical Fitness Index (PFI). The PFI battery consists of four muscular strength tests (right and left grips, back and leg lifts), two muscular endurance tests (pull-ups, push-ups), and lung capacity.

The Strength Index is the gross score from these tests. The PFI is derived from dividing the achieved Strength Index by the normal Strength Index and multiplying by 100; norms are based upon sex, age, and weight. A score of 100 is average; scores of 85 and 115 indicate the first and third quartiles respectively. A number of modifications of this test battery have been posed. The Oregon simplification predicts the Strength Index for boys from a reduced number of test items. Kennedy has successfuly proposed substitution of the tensiometer for the dynamometer in back and leg testing.

The selection of individuals with unsatisfactory PFI's for Physical Education: Values and Promotion includes at least three groups.

1. *Low scores:* Definitely weak individuals obviously need attention. Many choose 85 as the point below which pupils should be selected; others prefer the national average for the test; still others are governed by practical limitations of time and personnel for follow-up work and include as many of the low PFI's as the local situation permits.

2. *Declining scores:* With the exception of individuals with very high scores, drops in PFI (approximately 10 points or more), regardless of their level, may be a definite danger sign. They usually indicate undesirable changes in physical condition which need to be investigated.

3. *Extremely high scores:* Boys and girls may develop unusual musculatures through extended training in various types of strength-building activities, and, consequently, possess very high PFI scores, which would be a satisfactory status for them. However, in others, an extremely high PFI (150 and above) may indicate that they are high-strung, over-stimulated, and highly nervous. As a high degree of strength *may* thus be a symptom of such conditions, a PFI reduction becomes an indicator of the success of programmes designed to achieve the relaxation of individuals so afflicted.

Circulatory-Respiratory Endurance

Physical education has long been concerned with exercise for the development of circulatory-respiratory endurance. Such exercise requires moderate contraction of large-muscle groups for relatively long periods of time, involving major adjustments of the circulatory and respiratory systems to the activity, as in distance running and swimming.

Efforts to measure this component of physical fitness have taken two directions: (*i*) tests of circulatory-respiratory functions based on the premise that the endurance of the body is dependent upon the efficiency of these systems, hence, a measure of one is a

measure of the other; (*ii*) tests of running endurance. Extensive research has been conducted on the Harvard Step Test, which measures the pulse recovery following stepping up and down on a bench 20 inches high for five minutes at a rate of 30 steps per minute. Adaptations of this test have been made for secondary school boys and for college women and high school girls. Techniques for administering and scoring these tests have also been described by Clarke. The research evidence shows that trained athletes obtain better scores on this test than do untrained athletes and non-athletes.

The best correlations between a step test and motor-fitness criteria were achieved by Russell with college men as subjects. He utilised a 17-inch high bench for stepping and a cadence of 40 steps per minute. Stepping was continued until the subject was no longer able to maintain the cadence due to fatigue. His correlations were 70 with the University of Illinois Motor Fitness Test, 64 with the Air Force's Physical Fitness Test and with the Navy Standard Physical Fitness Test, and 61 with the Indiana Motor Fitness Test.

He also obtained the high correlation of.85 between the length of time the step test was continued and the gross oxygen intake on a treadmill run to exhaustion.

MEANING AND IMPORTANCE OF PHYSICAL FITNESS

MEANING

Physical fitness comprises two related concepts: general fitness and specific fitness. Physical fitness is generally achieved through exercise, correct nutrition and enough rest. It is an important part of life.

In previous years, fitness was commonly defined as the capacity to carry out the day's activities without undue fatigue. However, as automation increased leisure time, changes in lifestyles following the industrial revolution rendered this definition insufficient.

These days, physical fitness is considered a measure of the body's ability to function efficiently and effectively in work and

leisure activities, to be healthy, to resist hypokinetic diseases, and to meet emergency situations.

IMPORTANCE OF PHYSICAL FITNESS

Physical fitness is one of the most important things in life and one of the most valuable assets one can ever have. Health is one of the pre-requisites for a happy, well-balanced life. There are several advantages of being physically fit; here is how physical fitness helps you in the long run:

- *Cardiovascular Endurance*: Cardiovascular endurance is nothing but the measurement of your heart's strength. It also implies the ability of the body to deliver oxygen and nutrients to tissues and to remove wastes. Physical fitness helps you achieve cardiovascular endurance and helps to increase the oxygen flow to all the body muscles.
- *Muscular Strength*: A balanced and regular fitness regimen helps to increase the ability of muscles to exert force and sustain contraction. In short, to put it simply–a regular workout will make your muscles stronger and thus, increase your overall strength.
- *Self Confidence*: When you look good and you feel good– it is obvious that you have no inhibitions and insecurities to bog you down. A healthy mind and a healthy body are a big boost to your self-confidence.
- *Flexibility*: A regular workout session will ensure that you move your joints and muscles to their fullest extent and hence, it will increase the flexibility of these joints and your overall body. Flexibility in body movements is achieved only through physical fitness.
- *Body Composition*: One of the indicators of physical fitness is a balanced and healthy body composition. Minimum of fat and maximum of lean mass is a sign of a healthy and fit body. The lean mass includes muscles, bones, vital tissues and organs.
- *Beautiful You!*: Exercise and overall fitness helps you detoxify your body and thus lets your skin breathe. It also helps to tone your body and thus enhances your overall

appearance. So in short physical fitness keeps you beautiful and glowing.

- *Healthy Mind*: A healthy mind dwells in a healthy body. Any exercise included in your fitness regimen, will lead to the production of endorphins in the body. Endorphins are chemicals that make you feel happy and hence a healthy, physically fit body is always accompanied by a healthy mind.
- *Drive-away Illness*: Yes, it is true. Moderated and balanced workout in a fitness regimen helps to boost the immune system of the body. Fully functional and strong body immunity means that your body develops the strength to ward off diseases and infections.

So, in short, to have sense of satisfaction in your life–it is not just the materialistic things that you need–it is your own physical fitness, which will help you in the long run. A disease-free healthy body and mind are simply priceless! So what if you can earn big bucks by ignoring your health? What would you do with all the money, if you were not physically fit to enjoy its benefits? So, the next time you skip breakfast to rush to office or don't find the time to exercise owing to your busy schedules–think about this. Live your life to the fullest, but more importantly, live it wisely and invest time in your own health.

FITNESS VALUES OF PHYSICAL ACTIVITIES

No doubt exists that the right kind and amount of exercise will develop muscular strength and endurance, body flexibility, and circulatory-respiratory endurance. In fact, properly directed exercise is the only known means for acquiring the ability to engage in tasks demanding sustained physical effort. For this reason, physical education is indispensable in schools and colleges in order to develop strong and enduring bodies.

Physical education has a special responsibility for boys and girls who are below satisfactory levels of physical fitness. Such individuals, although, not ordinarily so considered, are, nevertheless handicapped physically, many seriously so, with accompanying defect ons of mental power and social adjustment. Thus, physically unfit boys and girls are incapable of prolonged

physical effort, are unable readily to learn and apply skills, and are awkward and lacking in poise; at all levels of intelligence, they have greater difficulty in maintaining mental effort and alertness; the sub-fit experience difficulty in day by day personal adjustments with others and in developing active social habits and attitudes.

Extensive studies over a period of years by many investigators in a number of fields have shown the basic relationships of adequate physical fitness and exercise to sound organic functions, to stamina for sustained activity, to proper mental alertness, to good social adjustment; in fact, they have a relationship to almost every desirable phase of mental health, physical well-being, and social efficiency. Very briefly, some evidence of these assertions follows. Other reviews by one of the authors and others have summarized the research pertaining to physical-mental-social relationships. Those mentioned here are representative of the studies found in this area.

Organic soundness: While Kraus coined the phrase earlier, Kraus and Raab extensively developed the concept of hypokinetic disease, defined as the "whole spectrum of inactivity-induced somatic and mental derangements." They developed the thesis that a minimum of physical activity is a prerequisite for healthful living, that lack of it is in part responsible for disease, and that lack of exercise constitutes a cause for a deficiency state comparable to avitaminosis.

As in every deficiency state, its results are most telling on the growing boy and girl. A number of investigations have shown that physically active people are much less prone to such chronic and disabling diseases as coronary heart attacks, duodenal ulcers, and other internal conditions.

After reviewing reports of medical studies published in the United States, Canada, England, Scandinavia, and Austria, Kraus and Raab conclude, "*...the overwhelming majority of published reports, based on statistical criteria and techniques, seems to lend strong support to the concept that a relationship between exercise habits and the susceptibility to functional and degenerative diseases of the myocardium does indeed exist.*" In agreement with this observation, Hein and Ryan of the American Medical

Association, after evaluating evidence in this area state: "A high level of physical activity throughout life appears to be one of those factors that act to inhibit the vascular degeneration characteristic of coronary heart disease, the most common cause of death among cardiovascular disorders." Low back pain is much more prevalent in the sedentary than in the physically active. Kraus reported that 80 per cent of his patients with this trouble were unable to pass his test of minimum muscular fitness. Physically active individuals, in general, age more slowly, have better weight control, and maintain a lower blood pressure level.

Mental alterness: A number of researches support the belief that physical fitness is related to mental accomplishments, especially as affecting mental alertness. Thus, it may be contended that a person's general learning potential, *for a given level of intelligence,* is increased or decreased in accordance with his degree of physical fitness. Some studies have shown little or no relationship between physical measures and mental achievement. These investigations, however, have been correlational in nature and have ignored the intelligence of the subjects. By contrast, in the studies showing physical-mental relationships, either the subjects were limited to those who were physically unfit, or subjects with high and low fitness scores were contrasted, or the subjects were equated by intelligence quotients but separated into high and low groups on physical tests.

These studies indicate that the individual is more prone to be mentally alert, to be vigorous in his applications, and to suffer less from efficiency-destroying fatigue when he is fit than when he is unfit.

Social adjustment: Among boys, especially, a positive relationship of strength to "prestige" traits has been demonstrated. Jones found that boys high in strength tend to be well adjusted socially and psychologically; boys low in strength show a tendency towards social difficulties, feelings of inferiority, and other personal maladjustments. Popp reported that five teachers and administrators generally selected boys with high relative (to age and weight) strength scores as most nearly like sons they would like to have; the reverse was true for boys with low relative strength.

FITNESS STATUS OF U.S. YOUTH

Despite the beliefs and assertions, too many boys and girls in our schools and colleges show clear indications of inadequate organic power, as reflected in early fatigue under a normal demand of muscular effort and muscular inefficiency reflected in poor motor skills, low strength indices, and lack of endurance. If proof is needed, consider the following summary made from many studies available.

Kraus reported that 57.9 per cent of eastern seaboard school children failed to meet even a minimum standard of muscular fitness. These children were far below similar accomplishments of children in Switzerland, Austria, and Italy, only 8.7 per cent of whom failed to meet this standard. He indicated further that this situation is not being alleviated, since American boys and girls leave their schools in much the same condition as when they enter. High failure rates on this test by American children have also been found by other investigators from many parts of the country.

Kraus also produced clinical evidence to show that adult patients with failures on two or more of his simple strength and flexibility tests were prone to lower back pain and manifested constant strain and frequently, emotional stress. These symptoms disappeared when patients performed prescribed exercises to strengthen the muscles of the abdomen and back and to stretch the muscles of the back and legs.

The AAHPER Youth Fitness Tests have been used to contrast the fitness of American children with their counterparts in other countries. In all instances, the American children were revealed with much lower typical performance on most of the items composing this test battery.

For example, the American boys and girls exceeded the means of the Japanese only on the test involving abdominal endurance; in the 600-yard run-walk, 98 per cent of the Danish boys and 99 per cent of the Danish girls exceeded the American averages for boys and girls; and British boys on the average for all tests and for all ages were at the 64th percentile for United States performance scores.

Utilising Rogers' Physical Fitness Index, Clarke reported that male students entering the University of Oregon with four years

of high school physical education had a considerably higher average than did those with two years or less. Typically, large numbers of students enter college with low Physical Fitness Indices, not only in Oregon, but generally throughout the country. Whittle found that 12-year-old boys in elementary schools with good physical education programmes had much higher scores on fitness and motor ability tests than did boys of the same age who had little or no physical education.

After administering physical fitness tests, Karpovich and Weiss concluded that personnel entered the Army Air Forces during World War II in fairly poor physical condition. Despite relatively high acceptance standards, these men were deficient in running speed, endurance of the abdominal muscles, and arm and shoulder strength, Other branches of the armed forces had and continue to have similar experience.

Cureton studied the fitness of 1000 young men upon entrance to the University of Illinois shortly before World War II with these negative results: 64 per cent could not swim 50 yards, 26 per cent could not chin four times, and 24 per cent could not jump an obstacle waist high. Similar results were obtained one year later with a larger sample of 3099 Illinois freshmen.

Chapter 4

Benefits of Physical Training

PRINCIPLES OF PHYSICAL TRAINING

Regardless of your level of fitness, there are seven principles that should be followed during any type of physical training or exercise programme. As laid out in the "U.S. Army Fitness Training Handbook," these seven principles also are known as Provrbs, an acronym for progression, regularity, overload, variety, recovery, balance and specificity.

Fig. There are seven basic principles to follow during any type of physical training.

Progression

To improve your level of fitness, you need to gradually increase both the intensity and duration of your physical training routine. According to author Robert Sterling Rush in his book "Enlisted Soldier's Guide," a safe level of progression can be achieved by increasing your cardiorespiratory and muscular ability by about 10 per cent every 10 days.

Regularity

It's also important to maintain an exercise regimen that is consistent, with exercise taking place at regular intervals. Physical training ideally should take place between three and five times each week. In addition, it's important to ensure you get adequate sleep and eat properly in order to operate at peak capacity during your physical training.

Overload

Overloading, according to the "U.S. Army Fitness Training Handbook," occurs when the work load of your exercise session exceeds the normal demands you place on your body. This involves pushing yourself so your heart works at a relatively high percentage of its maximum capacity. Determining the proper level of intensity, however, depends on a variety of factors, including age, weight and overall level of fitness. Overloading also takes place during muscular strength and endurance training when you work a muscle to failure.

Variety

It's easy to become bored with physical training if you perform the same routine every time, so it's important to mix things up by breaking up your training routine and include different activities. Not only will this prevent boredom, but it also can increase your motivation and help you achieve better results.

Recovery

The rest periods between physical training are just as important as the training itself, as muscle damage is repaired and waste is metabolized during these times. The optimum recovery time is between 24 and 48 hours after exercise. Recovery also

can be achieved by alternating more difficult training days with easier training days, or alternating muscle groups so you're not working the same muscles continually. Improper recovery can lead to muscle fatigue, increasing the potential for subsequent injuries.

Balance

When coordinating a physical training programme, it's important to ensure you're exercising all areas of the body equally to achieve a balanced level of fitness. For example, writes Rush in the "Enlisted Soldier's Guide," you should balance routines for the upper body and lower body, and balance endurance running with sprints in order to run as far and as fast as possible.

Specificity

The final principal is specificity, which seemingly contradicts the previous principle of balance by advising you focus on a specific ability during training. More precisely, however, the principle of specificity advises that you gear your training towards specific goals. For example, if your goal is to become a better runner, your training should have a greater focus on running, as activities such as swimming or cycling won't help you achieve this goal as efficiently.

THE TYPE OF BODY EXERCISES SHOULD BE CONSIDERED

Generally speaking, the dominant endomorph will score low on tests of physical and motor fitness; the dominant mesomorph will excel in tests or strength and power; the dominant ectomorph, if he has at least a moderate amount of mesomorphy, will do well on tests involving running and agility. Although not adequately studied, it may be conjectured that many boys and girls in classes for the physically unfit are either above average in endomorphy and or below in mesomorphy.

In planning exercises programmes, therefore, account should be taken of the fact that the dominant endomorphic boy is seriously handicapped in ability to perform physical activities and the dominant mesomorph is favoured in this respect. In support of this view, Clarke, Irving, and Heath found that no boys aged nine

through 15 years who were dominant endomorphs could chin themselves. Of 18 boys in this somatotype category, only two could perform a one-half chin. At 14 years of age, dominant mesomorphs averaged eight chins, while dominant ectomorphs and mid-types had mean performances of five and four chins respectively. For all boys in their sample, the mean Physical Fitness Indices for the different somatotype categories were as follows: mesomorphs, 124; ectomorphs, 121; mid-types, 116; endo-mesomorphs, 104; and endomorphs, 88. It should be added that the boys in the entire sample reported here were a superior group physically as compared with national standards.

Individuals must desire to improve: The desire of the unfit student, his basic attitude towards his own physical condition, is an essential factor in the attempt to improve his fitness status. Every effort must be made to secure the student's full cooperation, as the effectiveness of his exercise prescription will only be in proportion to the degree of his voluntary participation. Additional development of this topic will not be included here.

Consideration should be given to the individual's relative maturity: The relative maturity of the unfit student may be a factor in his ability to do well on tests of some physical fitness elements. Clarke and Harrison found this to be true for strength tests but not for motor fitness items.

These investigators contrasted various physical and motor performances of boys classified as advanced, normal, and retarded on the basis of skeletal age for each of three age groups, nine, 12, and 15 years. In general at each age, the advanced maturity group had significantly higher means than the normal maturity group and this latter group in turn had significantly higher means than the retarded maturity group on such gross strength tests as the Strength Index and the average of 12 cable-tension tests. However, for pull-ups and push-ups, significant differences between the means were not obtained; at two ages, this was also the case for the standing broad jump.

The determination of relative maturity, *i.e.*, whether the boy or girl is advanced, normal, or retarded for his or her age, has its difficulties. The use of skeletal age, which is based on an assessment of an X-ray of the hand and wrist is now generally

confined to the research laboratory. During adolescence, some estimation of maturity can be made by judging pubescent development. For girls, the date of menarche is also a helpful index. Pubescent development, however, is a crude indicator of maturity and has limited use, as shown by Clarke and Degutis in a study of 10, 13, and 16 year old boys. These investigators found that, at these three ages, physical maturation was differentiated by this means most effectively at 13 years, although it was not so sensitive to maturational change as skeletal age. At 16 years of age, maturational differentiation by pubescent assessment was much more limited. At 10 years of age, little or no value was attributed to this method.

Advance the unfit individual's psychological limits of effort: For unfit students, psychological tolerance for strenuous exercise is usually reached long before their physiological limits are attained.

The psychological limit is frequently conditioned by habit, boredom, slight aches, breathlessness, and by such mental factors as anxiety and fear of physical harm. All too frequently, such mildly distressful feelings halt exercise before there has been any real overloading; consequently, no appreciable increase in strength or endurance results. Here, some judgements must be exercised, since certain of the factors related to psychological limits also serve as safeguards, preventing overstrain.

Except for participants in highly competitive athletic events, very few boys and girls have ever been fully extended physiologically.

Actually, most live through the years of their youth—and, hence, through life—at a low level of energy expenditure. The stepping up of physical effort in intensity and duration is most desirable. For the unfit student, this process may be a gradual progression, in which he constantly attempts to improve his own former performances. Psychological tolerance for exercise, especially for the unfit, can best be developed in this way.

Thus, there may be considerable difference between a person's physiologic capacity and the output he is able to express through muscular effort at any given time; psychological limits are generally imposed in strength and endurance activities

involving "all-out" performances. The "cracking" of this psychologic barrier was demonstrated by Ikai and Steinhaus by use of hypnosis, a loud noise made by a starter's pistol, and a shout produced by the subject himself. Pastor demonstrated the value of simply setting goals, as opposed to urging subjects to exercise to exhaustion on the ergograph, in increasing the amount of work done by college men.

After considerable experimentation, Lawther observed that a subject's maximum effort is affected by his degree of motivation, his background of punishing experience, and his willingness to endure the pain of all-out effort.

Physical development should be tested and recorded at set times: A number of the exercise activities frequently included in unfit programmes, such as chinning, sit-ups, dips, weight lifting, and the like, are automatically self-testing. This self-testing may be formalised by use of individual progress charts, upon which the student records his performances on a particular day each week. Individual items on the physical or motor fitness test used to identify unfit students may be included on the progress chart as well with a repetition of the entire test every five or six weeks. It may also be desirable to record body weight from week to week; some unfit students should increase, some decrease in weight. These charts can be excellent motivational devices. More important, however, they provide constant check on student progress.

In the light of these eight principles, the question may now be asked: How should an exercise programme for any particular unfit student be prepared? This is an individual process to be studied by trial for each student. The first step is to determine his exercise tolerance by trying him out on different activities, including both strengthening and endurance elements. Thus, the unfit individual who cannot chin or dip should not be expected to do apparatus work, but should start on the mats with simple conditioning drills and modified chinning and dipping.

If he cannot do sit-ups or leg raisings, modified forms of these exercises must also be used at the start. If "once around the track" leaves him exhausted, the distance must be shortened or the pace lessened. Eventually, the amount of work the individual can do

without unreasonable discomfort will be determined. The other principles given can then be applied. The starting point, however, must be a proper evaluation of his exercise tolerance.

STRENGTH DEVELOPMENT

In selecting the right kind and amount of physical activity for any particular unfit boy or girl, the physical educator should consider the place of strength in the total physical fitness pattern. As viewed in this book, strength is a basic element; emphasis upon its development is vital for those who are sub-standard. However, for total-body fitness, exercise should not be limited to strengthening activities, but should be balanced properly by endurance (circulatory-respiratory) activities. Moreover, provisions should be made within the framework of the strength-endurance activity programme for other important developments, including skill, agility, flexibility, co-ordination, grace, poise, and so forth.

ISOMETRIC VS. ISOTONIC EXERCISE

In this presentation, *muscular strength* is defined as the maximum contraction that can be voluntarily applied in a single contraction. Two types of muscular endurance are recognised: *isometric,* whereby a maximum static muscular contraction is held; and *isotonic,* whereby the muscle continues to raise and lower a submaximal load.

A great many studies have been conducted to determine the relative effectiveness of isometric and isotonic exercises and of various systems of progressive resistance exercise in the development of muscular strength and muscular endurance. These studies have been summarized by Clarke; the conclusions drawn from his synthesis follow.

1. Both isometric and isotonic forms of exercise improve muscular strength. However, the evidence shows little if any difference in the effectiveness of the two forms in achieving strength increase; the same result was obtained for different systems of progressive resistance exercise. Considerable variation in individual strength improvement exists for both forms of exercise.

2. No study has verified the strength gain of 5 per cent per week for ten weeks (50 per cent for the entire period) from a single six-second daily contraction against resistance consisting of two-thirds of the muscle's strength, as reported by Hettinger and Mueller. Apparently, a more realistic, although perhaps still generous, figure is nearer 2 per cent each week.
3. The effects of isotonic exercise favour the improvement of muscular endurance and the retention of muscular strength following the cessation of exercise for a period of time. Isometric contractions restrict blood circulation to a greater extent than do isotonic contraction. For isometric work, Clarke found that the amount of oxygen, oxygen debt, and total oxygen requirement increase linearly in proportion to the size of the load; this constriction of circulation with attendant effects on the oxygen supply to the muscles logically restricts the development of muscular endurance when training with isometric exercise.
4. Hypotheses have been supported that the amount of tension developed in a muscle is a major factor in determining strength improvement and that the work done per unit of time is the factor essential in the extension of muscular strength and muscular endurance performances.
5. Nearly all studies on the conditioning effects of isometric and isotonic regimens of exercise utilised very limited training sessions. Possibly these brief exercise sessions are insufficient for adequate strength development or for any one method of exercising to achieve superiority over another. It may be contended that a person's rate of strength improvement depends largely upon the degree he overloads and that, in most of these studies, the overload principle has not been adequately applied.

Hellebrandt and Houtz have shed some light on the mechanism of muscle training in an experimental demonstration of the overload principle. In their application, the overload principle implies that the limits of performance must be persistently extended to improve muscle strength; and the rate of

improvement depends on the willingness of the subject to overload. Comparisons were made with the manner in which athletes extend themselves in training for and participating in their events. The following conclusions were drawn from their experimentation:

(a) The slope gradient of the training curve varies with the magnitude of the stress imposed, the frequency of the practice sessions, and the duration of the overload effort.

(b) Mere repetition of contractions which places little stress on the neuromuscular system has little effect on the functional capacity of the skeletal muscles.

(c) The amount of work done per unit of time is the critical variable upon which extension of the limits of performance depends.

(d) The speed with which functional capacity increases suggests that the central nervous system changes contribute an important component to training.

(e) The ability to develop maximal tension appears to be dependent on the proprioceptive facilitation with which overloading is associated. Hellebrandt and Houtz further demonstrated that currently popular systems of progressive resistance exercise, such as the DeLorme and the Oxford techniques, are conducted at a low level of overload.

Strengthening Activities

As will be surmised from the above, in choosing physical activities to develop strength, those which offer the greatest resistance to muscles should be selected.

Resistance supplied by parts of the body: In this category, the legs, arms, and trunk may supply the resistance elements, as is the case in "conditioning" drills, football "grass drills," "guerrilla exercises," Danish drills, and the like. Although calisthenics are in disrepute with many physical educators today (largely because of the atrocious manner in which they have been conducted), nevertheless they are valuable in developmental programmes, especially when individually arranged.

The dosage of exercise can be controlled, especially for convalescents and extreme sub-strength students; the exercise

series can be systematically planned to cover all muscle groups of the body with emphasis being placed on areas of greatest need; and progression can be regulated from very mild forms to vigorous and exhaustive efforts. Also, exercises of this type may be performed daily at home as special apparatus and exercise rooms are not required. Excellent systems of mat exercises can be devised which will provide for the development of body control, flexibility, and good posture, as well as increased strength. With good motivation of the unfit individual and with the application of appropriate methods, an enthusiastic response can be obtained and excellent results can be achieved.

Resistance supplied by inanimate objects: Utilising objects of various types and weights, the amount of exercise can be precisely prescribed through specification of the amount of weight lifted, the number of repetitions, and the cadence of movements. Furthermore, exercises can be designed to include all the large-muscle groups of the body, and exercise concentration can be placed on various muscles as desired. Barbell exercises, use of weighted dumbbells, log drills with iron wands, relays and races carrying weights, and the like, are examples of this type of exercise. These activities properly applied are probably the most effective methods of rapidly improving muscular strength and muscular endurance.

Resistance applied by entire body weight: The entire body weight can be used as the resistance medium. Arm strength is developed through chinning the bar, dipping from the parallel bars, use of travelling rings and overhead ladder, some forms of dance, and exercises on the horse, horizontal bar, and parallel bars. Development of leg muscles through vaulting from beatboard or springboard and bouncing on the trampoline, and constant use of abdominal and trunk muscles in lifting the legs and controlling the body are also effective in physical development.

Agility, co-ordination, neuromuscular control, flexibility, and poise are other benefits derived from modern dance, apparatus exercises, and tumbling exercises on the mats. The unfit individual, however, especially if he is subpar in strength, will not be able to perform even the simplest exercises on the apparatus. Thus, this form of strength development activity has limited usefulness until

strength sufficient to support the body with some facility has been developed by other means.

Resistance applied by another individual: For sub-strength individuals well advanced in development, exercises in which resistance is applied by another person may be used. Thus, wrestling, combatives, tug-of-war, and various pushes and pulls have excellent body-building values. Caution needs to be exercised, however, in utilising such activities for unfit individuals, until they have been conditioned sufficiently to benefit from them.

Chapter 5

Physical Education and Sport

CURRENT PHYSICAL EDUCATION CURRICULAM

As in the past, the present curriculum focusses on the unique and significant contributions of physical education in the development of every student.

The previous curriculum (1987) organized important goal statements under three domains: affective (attitude), cognitive (knowledge), and psychomotor (skills). The prescribed learning outcomes of the new curriculum are grouped under three curriculum organizers: Active Living, Movement, and Personal and Social Responsibility. In each organizer, the prescribed learning outcomes incorporate learning from the three domains. In addition, the previous curriculum provided seven movement categories, while the new curriculum has only three.

Nature and Scope of Physical Education, Exercise Science, and Sport:

- What is "contemporary physical education?"
- How do different areas of physical education relate to the field overall?
- What is the importance of creating your personal philosophy of physical education, exercise science, and sport?

Goals for Physical Educators

- Access to physical education and sport for all, regardless of: age, gender, race, ethnicity, sexual orientation, disability status, income, educational level, geographic location and ability.
- Prevent disease and positively contribute to health and well-being of all participants.

Expansion of Physical Education, Exercise Science, and Sport:

- Moved from the traditional school setting.
- Community.
- Home.
- Worksite.
- Commercial and Medical Settings.
- Corporations.

Who says Physical Activity is Good?

- National Reports:
- "Physical Activity and Health: A Report of the Surgeon General."
- "Healthy People 2010."
- "Promoting Better Health for Young People through Physical Activity and Sports".

Definition: Physical Education

- Physical education.
- An educational process that uses physical activity as a means to help people acquire skills, fitness, knowledge, and attitudes that contribute to their optimal development and well-being.
- Contributes to the development of the whole person.
- Education.
- An on-going process that occurs throughout our lifespan.

Definition: Exercise Science

- Exercise Science.
- The scientific analysis of exercise or physical activity through theories from many different disciplines such as biology, biochemistry, physics, and psychology.

Definition: Sports

- Organized competitive activities governed by rules that standardize the competition and conditions so individuals can compete fairly.
- Competition against oneself or opponent(s).
- Strategy and skill play a significant role in the determination of the outcome.

Definition: Athletics

- Highly organized, competitive sports.
- Skillful participants.

Our Physical Activity Challenge

Improve Participation of Populations with Low Rates of Physical Activity: Current Participation Patterns:

- Women are generally less active than men at all ages.
- African Americans and Hispanics are generally less active than whites.
- People with low incomes are typically not as active as those with high incomes.
- People with less education are generally not as active as those with higher levels of education.
- Adults in the Northeast and South tend to be less active than adults in the North Central and Western States.
- People with disabilities are less physically active than people without disabilities.
- Participation in physical activity declines with age. By age 75, one in 3 men and one in two women engage in no physical activity.

U.S. Department of Health and Human Services. Healthy People 2010: Understanding and Improving Health. Washington, DC: U.S. Government Printing Office, November, 2000.

The Field (More than a Playing Surface!)

- Field…. "a combination of a well-established discipline and one or more professions that deliver a social service and are focused on common goals." (Corbin).

- Discipline "organized body of knowledge embraced in a formal course of learning." (Henry).

Physical Education, Exercise Science and Sport: The Profession

- Profession.
- An occupation requiring specialized training in an intellectual field of study that is dedicated to the betterment of society through service to others.
- Some examples of professional organizations:

Organizing the Profession

- With developing technologies, knowledge, and methods of enquiry from other disciplines in the 1960s, physical education, exercise science, and sport broadened its horizons to incorporate the fields of psychology and sociology.
- The result:12 subdisciplines.

Sub-disciplines

- Exercise physiology
- Sports medicine
- Sport biomechanics
- Sport philosophy
- Sport history
- Sport psychology
- Motor development
- Motor learning
- Sport sociology
- Sport pedagogy
- Adapted physical activity
- Sport management.

Exercise Physiology

- Impact of exercise and physical activity on the human body.
- Short-and long-term adaptations of the various systems of the body.

- Effects of physical activity and exercise on the health status of different populations.
- ACSM.

Sports Medicine

- Medical relationship between physical activity, sports-related injuries, and the human body.
- Prevention-the design of conditioning programmes, fitting of protective equipment, and counseling regarding proper nutrition.
- Treatment and rehabilitation-the assessment of injuries, administration of first aid, design and implementation of rehabilitation programme and treatment.

Sports Biomechanics

- Applies the methods of physics to the study of human motion and the motion of sport objects.
- Study the effects of force on the body and sport objects.
- Mechanical analysis of activities (production of power, leverage, and stability).
- Analysis of effectiveness and efficiency of movements.

Sports Philosophy

- Study of the nature of reality and values of movement for all participants.
- Debate critical issues, beliefs, and values relative to physical education and sport (i.e.What is the relationship between the mind and the body?).
- Influences thoughts, actions, and decisions in our professional endeavors and personal lives.

Sports History

- Critical examination of the past with a focus on events, people, and trends that influenced the direction of the field.
- The "who, what, when, where, how, and why of sport" is examined within the social context of the time.
- Looking into the past provides greater understanding of present events and insight with respect to the future.

NASSH: North American Society for Sport History publishes the Journal of Sport History.

Sport and Exercise Psychology

- Uses principles from psychology to study human behaviour in sport to enhance performance.
- *Sport Areas:* achievement motivation, arousal regulation, goal setting, self-confidence, leadership, and team cohesion.
- *Exercise Areas:* exercise addiction, adherence, motivation, and satisfaction.

Sport and Exercise Psychology

- Sport areas
- Achievement motivation
- Arousal regulation
- Goal setting
- Self-confidence
- Leadership
- Team cohesion
- Exercise areas
- Exercise addiction
- Adherence to exercise
- Motivation
- Satisfaction
- Uses principles from psychology to study human behaviour in sport to enhance performance

Motor Development

- Interaction of genetic and environmental influences on movement and lifespan motor development.
- Use theories of development to design appropriate movement experiences for people of all ages and abilities.

Motor Learning

- Study of factors that influence an individual's acquisition and performance of skills, such as practice, experience, use of reinforcement, and condition of learning environment.

- Progression through stages of learning from a beginner to a highly skilled performer.

Sport Sociology

- Study of the role of sport in society.
- "What is the influence of society on sport?"
- "What is the influence of sport on society?"

Centre for the Study of Sport in Society at Northeastern University publishes the Journal of Sport and Social Issues.

Sport Pedagogy

- Study of teaching and learning.
- Creation of effective learning environments, instructional strategies, outcome assessment, and relationship of instructional process to learning.
- Development of effective practitioners through the analysis of the behaviours of teachers/coaches and students/athletes.

Adapted Physical Activity

- Providing individual programmes and services that encourage participation to the fullest extent by those with disabilities.

Sport Management

- Encompasses the managerial aspects of sport and sport enterprise.
- Facility and personnel management, budgeting, promotion of events, media relations, and programming.
  The Journal of Sport Management is the official journal of the North American Society for Sport Management (NASSM).

A New Name for the Field

- Physical Education-traditional, but too narrow; does not reflect the expanding nature of the field.
- Kinesiology-study of human movement, but the public is not familiar with the term.

- Exercise and Sport Science-reflects the broad emphasis of the field and easy to understand.
- Physical Education and Sport-traditional, familiar, and includes sport as a vital part.
- No common agreement as to the name of the field, but there is a growing central focus: Physical Activity.

Allied Fields

- Health.
- Health Instruction.
- Health Services.
- Environmental Health.
- Recreation.
- Dance.

These fields share many purposes with physical education, exercise science, and sport, but the content of the subject matter and methods to reach their goals are different.

Definition of Terms

- *Health:* A state of positive well-being associated with freedom from disease or illness.
- *Wellness:* A state of positive biological and psychological well-being that encompasses a sense of well-being and quality of life.

Definition of Terms

- *Holistic Health: T*he physical, mental, emotional, spiritual, social, environmental, and genetic factors' influence on an individual's life. (similar to wellness).

- *Quality of Life:* overall sense of well-being that has a different meaning for each individual.

Definition of Terms

- *Physical Activity:* any bodily movement produced by the contraction of the skeletal muscles that increases energy expenditure above the baseline level.
- *Exercise:* physical activity that is planned, structured, and

repetitive with the purpose of developing, improving, or maintaining physical fitness.

Definition of Terms

- Physical Fitness: the ability to perform daily tasks with vigour and without undue fatigue, and with sufficient energy to engage in leisure-time pursuits, to meet unforeseen emergencies, and the vitality to perform at one's fullest capacity.
- Health-related and Performance-related physical fitness: what are the components of each?

Physical Fitness

- Health-related Fitness.
- Cardiovascular endurance.
- Body composition.
- Flexibility.
- Muscular endurance.
- Muscular strength.
- Performance-related Fitness.
- Agility.
- Speed.
- Coordination.
- Power.
- Reaction time.
- Balance.

Philosophy

- "The love of wisdom" (Greek).
- A set of beliefs relating to a particular field.
- A system of values by which one lives and works.
- Helps individuals address the problems that confront them through the use of critical thinking, logical analysis, and reflective appraisal.

Branches of Philosophy

- Metaphysics-the ultimate nature of reality; what is real and exists.

- Epistemology-the nature of knowledge.
- Logic-Examines ideas in an orderly manner and systematic way.
- Axiology-the nature of values.
- Ethics: issues of right and wrong, responsibility, and standards of conduct.
- Aesthetics: the nature of beauty and art.

General Philosophies

- *Idealism:* The mind interprets events and creates reality; truth and values are absolute and universally shared.
- *Realism:* The physical world is the real world and it is governed by nature; science reveals the truth.
- *Pragmatism:* Reality and truth is determined by an individual's life experiences.
- *Naturalism:* Reality and life are governed by the laws of nature; the individual is more important than the society.
- *Existentialism:* Reality is based on human existence; individual experiences determine what is true.
- *Humanism:* Development of the full potential of each individual. Emphasized meeting the needs individuals' needs.

Philosophical Approaches

- "Education of the Physical"
- Focus on fitness development and acquisition of skills. the development of the body
- "Education through the Physical"
- Focus on the development of the total person: Social, Emotional, Intellectual, and Physical development

Sport Philosophy

- Study of the true meanings and actions of sport and how sport contributes to our lives.
- Eclectic philosophy of education (1875-1950).
- Comparative Systems Approach (1950-1965).
- Disciplinary Approach (1965-present).

- Sport philosophy offers us guidance in addressing inequities in physical activity opportunities experienced by underserved populations.

Why Develop Your Own Philosophy?

- Assists in the development and clarification of beliefs and values that guide your behaviours.
- Aids in decision-making.
- Helps determine goals, objectives, and methods of instruction and evaluation used in physical education programmes.

PHYSICAL EDUCATION, SPORT AND PRO-SOCIAL BEHAVIOUR

Historically, claims have also been made about Physical Education and sport in relation to positive social development and particularly, pro-social behaviour outcomes. In relation to social outcomes arising from Physical Education and sport, and specifically, positive social development, Bailey was clear that the research evidence is 'equivocal'. A positive association between participation and pro-social behaviour is by no means assured and furthermore, 'there is evidence that in some circumstances behaviour actually worsens'. Bailey also reported, however, that 'numerous studies have demonstrated that appropriately structured and presented activities can make a contribution to the development of prosocial behaviour, and can even combat antisocial and criminal behaviours in youth', adding that 'the most encouraging findings come from school based studies, especially those focusing on PES curriculum programs'.

Once again, targeted intervention studies directed towards the achievement of specific social behaviour outcomes, have proved successful: Intervention studies have produced generally positive results, including improvements in moral reasoning, fair play and sports person ship, and personal responsibility. It also seems that the most promising contexts for developing social skills and values are those mediated by suitably trained teachers and coaches who focus on situations that arise naturally through activities, by asking questions of students and by modeling appropriate responses

though their own behaviour. Bailey similarly identified mixed research evidence in relation to the extent to which Physical Education and sport can be regarded as aiding social inclusion. He reported that some writers contend that Physical Education and sport 'not only reflects but can also contribute to some groups' social exclusion', but also acknowledged that …positive experiences do seem to have the potential to, at least, contribute to the process of inclusion by bringing individuals from a variety of social and economic background together in a shared interest, offering a sense of belonging to a team or a club, providing opportunities for the development of valued capabilities and competencies, and developing social networks, community cohesion, and civic pride.

Undoubtedly, some of the most significant research and curriculum development work to be undertaken in relation to these issues is that associated with Sport Education and derivatives of it. Since Siedentop's original work in 1994, a comprehensive international body of research, with many contributions from Australia, has demonstrated that Sport Education can provide a curriculum and pedagogical model via which self-management and inter-personal skills, personal and social responsibility can be very effectively addressed–while at the same time, also linkages are made to learning in other areas of the curriculum.

At the heart of Sport Education is a focus on positive learning and participation experiences and inclusivity. With this emphasis, it has proved a means via which to effectively enhance students' sense of belonging, personal and social responsibility, and perceived competency. Notably, these positive outcomes are reported in relation to students who would otherwise be disengaged and/or excluded from physical education, sport or schooling. The relationship between Physical Education and Sport and students' attitudes towards schooling, academic development and/or academic achievements are all matters of growing interest.

PHYSICAL EDUCATION, SPORT AND ATTITUDES TOWARDS SCHOOLING

In relation to attitudes towards schooling, Bailey identified that evidence of Physical Education and sport having any positive

influence is limited and has arisen from small-scale studies and/ or is based on anecdotal evidence. Bailey also reported, however, that in some studies improvements in attendance have been shown to follow the introduction of Physical Education and sport initiatives, and 'there is evidence from studies of pupils at risk of exclusion from school that an increase in the availability of PES programmes would make the school experience more attractive'. The Physical Education and School Sport project in England, developed by the Qualifications and Curriculum Authority in partnership with primary, secondary, special schools and community sport providers has pursued affective outcomes of PESS.

The QCA report that case studies of schools and partnerships have shown that as a result of investing in PESS, 'schools are happier, healthier and more successful: pupils have greater confidence and self-esteem'.

The QCA identified that the greatest strengths identified in students experiencing quality physical education and school sport were: 'commitment, skillfulness, willingness to get involved and enjoyment'. The QCA also reported that development of PESS has been successfully linked to efforts to specifically increase attendance at school and to targeting behavioural issues. Further, all of the schools involved in the PESS investigation are reported to have seen improvements in pupils' confidence, self-esteem, desire to learn, concentration and time on task as a result of investing in PESS.

Afternoon lessons are identified as more productive after an active lunchtime, with less disruption and students ready to learn. The significance of the PESS findings is their relevance to whole schools and all teachers–not only those in Physical Education! There remains, however, a need for caution in relation to claims about psycho-social and attitudinal outcomes arising from Physical Education and sport experiences.

It is essential to acknowledge the individuality of experiences and thus, their effect. As Bailey has highlighted, it would be misleading to suggest any assured impact of Physical Education in terms of attitudes towards school and/or learning on the part of all children, simply because provision, and particularly

inappropriate provision, can have precisely the opposite outcomes to those intended, including disengagement and/or disillusionment.

PHYSICAL EDUCATION, SPORT AND ACADEMIC ACHIEVEMENT

Bailey discussed physiological changes relevant to a prospective relationship between Physical Education and sport and academic performance. He explained that it has been suggested that by increasing blood flow to the brain, Physical Education and sport may enhance mood, mental alertness and self-esteem. 'The evidence base of such claims is varied and more research is still required. However, existing studies do suggest a positive relationship between intellectual functioning and regular physical activity, both for adults and children'. Effects rather than the underlying mechanisms are arguably of greater interest here.

Results of a sustained study undertaken in the United States of the relationship between the time students spent in Physical Education and academic performance were published in 2008. Carlson et al identified that grade-point averages, scores on standardised tests can be regarded as direct indicators of academic achievement and that grades in specific courses; measures of concentration, memory, and classroom behaviour can be deemed indirect indicators. Their study was a longitudinal study of students in kindergarten through to fifth grade, and involved a nationally representative sample group. Measurement of academic achievement was a standardised test administered at 5 time points. Time spent in physical education was ascertained and used as a basis for categorising children as involved in low, medium, or high amounts of physical education.

Academic achievement in terms of performance in mathematics and reading tests was scored on an item response theory scale. Gender differences were observed in this research. For girls, there was some evidence of a positive association between time engaged in physical education and academic achievement: Girls in all grades who were in the low physical education category had the lowest IRT scale scores for mathematics and reading, although only in kindergarten and first

grade were these differences significant for reading and mathematics. In fifth grade differences were significant for reading only. No association between time engaged in physical education and academic achievement was found for boys. Similar results arose when the researchers pursued longitudinal associations. From kindergarten through fifth grade, girls with the highest exposure to physical education scored on average 2,4 points higher on the IRT reading scale and on average 1,5 points higher on the IRT mathematics scale than did those in the low physical education category. Again, no association was found for boys.

Carlson *et al* concluded that their study supported other research in identifying that time spent in physical education does not adversely affect academic achievement and that 'fear of negatively affecting academic achievement does not seem to be a legitimate reason for reducing or eliminating programmes in physical education'. Further, the findings for girls suggest that more time in physical education, may have a positive impact on academic performance.

Similarly, Bailey concluded that: Overall, the available research evidence suggests that increased levels of physical activity in school-such as through increasing the amount of time dedicated to PES-does not interfere with pupils' achievement in other subjects and in many instances is associated with improved academic performance. The QCA's report on the PESS project in England has provided further positive indications in relation to these issues. Specifically, the QCA reported that the targeted investments in Physical Education and Sport have positively impacted upon student attainment in Physical Education at the end of primary schooling and in terms of examination course results in Physical Education and dance.

As the QCA have acknowledged, attributing broader academic improvement to participation in PESS is problematic, but the indications of impact arising in the project are nevertheless encouraging. Specifically, all of the schools involved in the PESS investigation from the outset have seen improvements in their national curriculum test and GCSE results. Many school principals feel that PESS has had a significant impact on learning achievements across the curriculum and teachers have reported

improvements in students' confidence, concentration and achievement. Improvements in all of these respects are clearly fundamental to advancing student learning and are relevant to students' social well-being.

THE FORMATION OF NATIONAL IDENTITY

In addition to the social practices that contribute actively to a nation's image, national cultures are characterized by competing discourses through which people construct meanings that influence their self-conception and behaviour. These discourses often take the form of stories that are told about the nation in history books, novels, plays, poems, the mass media, and popular culture. Memories of shared experiences-not only triumphs but also sorrows and disasters-are recounted in compelling ways that connect a nation's present with its past.

The construction of a national identity in large part involves reference to an imagined community based on a range of characteristics thought to be shared by and specific to a set of people. Stories and memories held in common contribute to the description of those characteristics and give meaning to the notion of nation and national identity. Presented in this way, nationalism can be used to legitimize, or justify, the existence and activities of modern territorial states.

Sports, which offer influential representations of individuals and communities, are especially well placed to contribute to this process of identity formation and to the invention of traditions. Sports are inherently dramatic. They are physical contests whose meanings can be "read" and understood by everyone. Ordinary citizens who are indifferent to national literary classics can become emotionally engaged in the discourses promoted in and through sports.

Sometimes the nationhood of countries is viewed as indivisible from the fortunes of the national teams of specific sports. Uruguay, which hosted and won the first World Cup football championship in 1930, and Wales, where rugby union is closely woven with religion and community to reflect Welsh values, is prime examples. In both cases national identity has been closely tied to the fortunes of male athletes engaged in the "national

sport." England's eclipse as a cricket power is often thought, illogically, to be symptomatic of a wider social malaise. These examples highlight the fact that a sport can be used to support, or undermine, a sense of national identity. Clifford Geertz's classic study of Balinese cockfighting, Deep Play: Notes on the Balinese Cockfight, illustrates another case in point. Although Balinese culture is based on the avoidance of conflict, men's identification with their birds allows for the vicarious expression of hostility.

PATRIOT GAMES

By the beginning of the final decades of the 19th century, sports had become a form of "patriot games" in which particular views of national identity were constructed. Both established and outsider groups used and continue to use sports to represent, maintain, and challenge identities. In this way sports can either support or undermine hegemonic social relations. The interweaving of sports and national identity politics can be illustrated with several telling examples. In 1896 a team of Japanese schoolboys soundly defeated a team of Americans from the Yokohama Athletic Club in a series of highly publicized baseball games.

Their victories, "beating them at their own game," were seen as a national triumph and as a repudiation of the American stereotype of the Japanese as myopic weaklings. Similarly, the "bodyline" controversy of the 1932-33 crickets Test series between Australia and England exemplifies the convergence of sports and politics.

At issue were the violent tactics employed by the English bowlers, who deliberately threw at the bodies of the Australian batsmen in order to injure or intimidate them. The bowlers' "unsporting" behaviour raised questions about fair play, good sportsmanship, and national honour. It also jeopardized Australia's political relationship with Great Britain. So great was the resulting controversy that the Australian and British governments became involved.

Arguably, one consequence was the forging of a more independent attitude in Australians' dealings with the British in the political, economic, and cultural realms. The Soviet Union's

military suppression of reformist efforts to create "socialism with a human face" in Hungary and in Czechoslovakia were followed by famous symbolic reenactments of the conflicts in the form of an Olympic water-polo match and an ice hockey encounter. In both cases, sports were invested with tremendous political significance, and the Soviet team's defeat was seen as a vindication of national identity.

NATIONAL CHARACTER

In each of these examples, a historical legacy was invoked, past glories or travesties were emphasized, and the players were faced with maintaining or challenging a set of invented traditions. This link between sports, national culture, and identity can be extended further. Some sports are seen to encompass all the qualities of national character. In the value system of upper-class Englishmen, for example, cricket embodies the qualities of fair play, valour, graceful conduct, and steadfastness in the face of adversity.

Seen to represent the essence of England, the game is a focus of national identification in the emotions of upper-class males. Moreover just as Englishness is represented as an indefinable essence too subtle for foreigners to comprehend so too are the mysteries of cricket deemed to be inscrutable to outsider. In a similar manner, bullfighting has been portrayed in the visual and the verbal arts as a material embodiment of the Spanish soul, Gaelic football is thought to be an expression of an authentic Irishness, and sumo wrestling is said to represent the indefinable uniqueness of Japanese culture.

TRADITIONS AND MYTHS

National culture and identity are also represented by an emphasis on origins, continuity, tradition, and timelessness. For most English people, for example, the origins of their culture and national identity seem to be lost in antiquity. Englishness is taken for granted as the result of centuries of uninterrupted tradition. This emphasis on continuity is strikingly evident in sports contests between nations. Accordingly, when teams from England and Scotland compete, they are characterized as "auld enemies." That

political institutions are also imbued with a sense of venerable tradition is easily exemplified in the pageantry that surrounds the English monarchy. Yet the traditions associated with both the monarchy and sports are not as old as claimed. Indeed, both appear to be based on foundational myths-that is, on myths that seek to locate the origins of a nation, a people, or a national character much earlier in time and place than the evidence supports.

Baseball, which for a century was considered to be the "national game" of the United States, is a case in point. Instead of tracing the origins of the game to its English roots in children's games such as cat and rounders, Americans accepted the addled recollections of a lone octogenarian and credited Abner Doubleday with having invented a game that he may never have played. Similarly, Italians use the word calcio to describe the sport known to the rest of the world as "association football," as "soccer," or simply as "football".

The use of calcio implies that the origins of modern football can be traced to Renaissance Italy. Sumo provides another striking example of invented tradition. The colourful traditional costume worn by sumo officials suggests that the sport has evolved almost unchanged since the 11th century, but the costume was actually devised in 1909 during a period of intense nationalism. The role sports play in the interaction of culture and national identity is sometimes viewed as inherently conservative.

Some believe that the association of sports with nationalism goes mere patriotism and becomes chauvinistic and xenophobic. The behaviour of football hooligans at international matches lends support to the argument. On the other hand, sports also have contributed to liberal nationalist political struggles. One frequently cited example is the 19th-century Slavic gymnastics movement known as Sokol.

Gymnastic clubs in what is now the Czech Republic, Slovakia, and Poland were in the forefront of the struggle for national liberation from Austrian and Russian rule. A similar role was played by Algerian football clubs when they became centres of resistance to French colonialism. Sports-through the use of nostalgia, mythology, invented traditions, flags, anthems, and ceremonies-contribute greatly to the quest for national identity.

Sports serve to nurture, refine, and develop the sense that nations have of themselves. Yet, in the context of global sports, this role has become increasingly contradictory. In introducing people to other societies, global sports strengthen cosmopolitanism even as they feed ethnic defensiveness and exclusiveness. For example, the development of cricket in South Asia reflects that region's imperial past and postcolonial present, but the game has taken on uniquely Indian, Pakistani, and Sri Lankan attributes far removed from the pastoral values associated with the English village green.

AN ESSENTIAL FOUNDATION FOR LIFELONG PHYSICAL ACTIVITY

Physical Education represents a 'window of opportunity' not merely for an immediate involvement in activity, but also for the development of skills, knowledge, understandings, values and attitudes that underpin children's ability to access and enjoy physical activity and sport in childhood and in later life. Bailey's review stressed the need to consider the consequences of children not developing what we might term basic physical and movement literacy and specifically acknowledge that children face the prospect of exclusion from physical activity and sport thus denying them of the physical, social and emotional benefits that can arise from participation.

Physical Education can be invaluable in providing for the structured development of movement skills that are fundamental to participation in physical activity and sport. The widespread development of Fundamental Motor Skills programmes across Australia and internationally has been directed to precisely this outcome.

The work just published by Bailey *et al* reaffirmed that 'there is suggestive evidence of a distinctive role for PESS in the acquisition and development of children's movement skills and physical competence'. Bailey *et al* also stated that 'It can be argued that these are necessary, if not deterministic conditions of engagement in lifelong physical activity'. But as Bailey previously identified, further research is needed to explore the extent to which Physical Education positively influences patterns of participation in physical activity and sport during and beyond the school years. Bailey reported that while there is some evidence pointing to the

likely maintenance of health-related behaviours that are established in childhood, evidence relating to the maintenance of physical activity patterns overtime is mixed. Physical Education and school sport will ultimately be one influence among many that can impact positively or negatively upon current and long-term patterns of behaviour and participation in physical activity and sport. An ongoing challenge for all physical educators is to seek to ensure that all children feel that they are valued in physical education, physical activity and sport contexts.

PHYSICAL EDUCATION, SCHOOL SPORT AND PHYSICAL ACTIVITY

In both the United States and United Kingdom, initiatives have acknowledged that the contribution that Physical Education lessons can make in relation to recommended physical activity for children is important but needs to be acknowledged as one of a number of contributions needed. Recess, lunchtime and activities organised before and/or after school have been positioned with Physical Education in 'whole school' approach to enhancing physical activity time through the school day and week. Coordinated efforts are undoubtedly crucial if the prospective benefits of participation in Physical Education and school sport are to be realised.

In 2007 Evenson, Ballard, Ginny and Ammerman undertook a research project specifically focusing on the North Carolina State Board of Education's 2005 update to the Healthy Active Children Policy, to include a requirement that all kindergarten through to eighth-grade children receive at least 30 minutes of moderate-to-vigourous physical activity each school day through physical education, recess, and other creative approaches.

Their study provided important insights into the ways in which an extent to which the new requirement was being met and the successes and challenges experienced in implementation. All NC school districts were asked to complete an online survey after the first full year of implementation of the policy in 2007. Of the 106 school districts that completed the survey, 83 per cent reported that the Healthy Active Children Policy was incorporated with their wellness policies and 67 per cent reported it as integral to their school improvement plans.

The 30 minutes of daily moderate to vigourous physical activity required by the NC Healthy Active Children Policy was achieved primarily through recess, physical education, and classroom Energisers for elementary schools. For middle schools, these three components were also the main contributors, with more reliance on physical education and less on recess and classroom Energisers. Based on strategies the survey queried, these data indicate that some districts did not meet the 30-minute physical activity recommendation.

The study also generated notable reports of positive effects of the policy in both elementary and middle schools; specifically:

- Ggreater student focus on studies;
- Physical activity participation of students;
- Awareness of healthy habits;
- Student alertness;
- Student enjoyment;
- Staff involvement.

These findings align with recent work in England that has sought to capitalise on the capacity of integrated Physical Education and school sport initiatives to have multiple benefits for children's education and development. Addressing mental health and attaining enhanced social and emotional well-being amongst young people clearly remains a major contemporary challenge in Australia.

This is another area in which further research is certainly needed–particularly to pursue, whether improvements seen to arise from school-based interventions and curriculum initiatives can be sustained beyond them and over time. The development and implementation of the Mind Matters resources has undoubtedly provided welcome support for curriculum provision directed towards mental health and well being in many schools. A commissioned evaluation of the classroom implementation of the curriculum resource 'Understanding Mental Illness" pointed to improvements in students' knowledge, attitudes and behavioural intentions that could arise from the teaching of the UMI module, particularly immediately post-teaching.

In relation to the more sustained benefits, it was noted that: At delayed post-teaching, with cautionary interpretation due to a

small number of participant responses, students' knowledge showed a predictable decline whilst attitude and behavioural intentions continued to improve.

Encouragingly, Bailey's review identified that while we may not fully understand the mechanisms that underpin effects, 'there is now fairly consistent evidence that regular activity can have a positive effect upon the psychological well-being of children and young people'. More specifically, he reported that 'the evidence is particularly strong with regards to children's self-esteem' and that research has also associated regular activity with reduced stress, anxiety, and depression. In his view, evidence is thus growing to support claims that 'well-planned and presented PES can contribute to the improvement of psychological health in young people'.

Chapter 6

Training Preconditions and Framework

INTRODUCTION

Training courses for the socially disadvantaged are not significantly different from other training courses if modern didactic principles are taken into account. However, this target group requires greater didactic and educational expertise on the part of the trainer.

Motivation, group dynamics, communication and cultural aspects assume greater prominence. In particular, the trainer needs to think about the perceived balance of power if he wishes to empower individuals who not infrequently carry the stigma of powerlessness.

Three interacting components of the training course mutually influence one another: The trainer, the participants and the training course itself.

In addition to these principal actors, the situational context should not be overlooked.

THE TRAINING COURSE

The training course can follow particular principles to meet participants' needs and to ensure a positive and productive atmosphere.

Trust

It is very important for the participants to feel accepted and to develop trust in the trainer and training.

This can be fostered by the following aspects:

- Training should always take place under the aegis of a known organisation or institution and not under the personal responsibility of an individual trainer.
- It can be helpful for participants to get to know the trainer and the premises before training commences. As a result they will be familiar with the setting and will already feel somewhat more confident when the training gets under way. Individuals who do not feel confident can cancel their participation in the training without losing face.
- The participants should receive detailed prior information about the content, techniques and rules of the training course.

Acceptance and Good Atmosphere

A good atmosphere within the group and mutual acceptance between participants are essential for staging a successful training course, especially when we are working with target groups who are familiar with rejection and social exclusion in their day-to-day lives.

This requires a number of basic rules:

- The group atmosphere has first priority. Conflicts between participants should be discussed immediately. Quite incidentally, these situations lend themselves to practicing social skills in a practical context.
- A number of basic rules should be agreed at the beginning of the training course, for example feedback rules, accepting different opinions and previous experiences etc. Depending on the group and timeframe, these rules can be developed together with the participants.
- Training should be fun. Sufficient time should be scheduled for breaks, relaxation or games and exercises to lighten the atmosphere.

Take Account of Participants' Needs

The training course should take account of the participants' needs and specific characteristics:

- When the training course gets underway, participants should have the opportunity to express their needs and expectations.
- Participants should be actively involved in designing the training course. In the process they can be helped to identify and select their learning goals for the training course themselves.
- The training course design and techniques should be consistent with the target group's cultural and social background. Participants should be able to introduce their cultural identity.
- The training course content and techniques should tie in with the target group's previous knowledge and everyday life.
- Participants need to be motivated and empowered to transfer their newly acquired skills to everyday life and try them out in "real" situations.
- The learning process should envisage small steps from the familiar to the unfamiliar and from simple to more challenging material. It is the trainer's responsibility to ensure that each participant is able to follow the learning process.
- The participants' questions and expectations should be answered.
- If possible, the participants should be able to continue their learning process after the training course. For example, this can be in the form of an ongoing training course or by group meetings for exchanging information.
- The results and learning successes should be acknowledged upon conclusion of the training course. Firstly, respect should be shown for the participants' commitment and successes. Secondly, the participants should receive a form of certificate or written reference that they can specifically use for their own purposes (*e.g.* applications).

THE TRAINER

We would like to shed more light on the trainer's skills, characteristics and tasks which we consider to be necessary for positively and successfully implementing this training concept for the socially disadvantaged. We are aware that we are portraying an optimal picture and thereby setting high standards. It seems to us to be important to strike a balance between the maximum amount of available staffing resources that can be employed and the minimum number of personnel required to ensure the quality of the training course. Nevertheless we would like to encourage small institutions as well to conduct a training course such as this. Before we turn our attention to the characteristics of the trainer, we would like to discuss the preferred number of trainers to implement the training course.

Individual Trainer or Team

Is it enough to have one single specialist available to implement the training course or is it necessary to work in a team? Our training concept aims to develop different skills areas using diverse methods which require the trainer to possess multiple skills. We would like to mention that we recommend training teams of at least two people for any type of training course.

There are many reasons for this:
- Implementing an interactive training course and coordinating the group requires a great deal of work, especially if the training course is to be designed to be interesting and maintain the participants' motivation. Nobody can deliver 100 per cent performance throughout the entire day.
- It requires very different capabilities and skills to implement a training course and coordinate a group of participants. Nobody is perfect–a number of trainers can complement one another's strengths and specialist skills.
- To ensure that flexibility is designed into the training schedule and that the course is tailored to the participants' needs and resources, one needs to look at the entire sequence of events and processes as they relate to group dynamics.

- As with every human, trainers and participants as well are influenced by sympathy and antipathy. It would be regrettable if the training were to miss its mark because a participant could not get on with the trainer as an individual. Employing a training team increases the chance of each participant finding a contact person he can trust.

What appears to be optimal is:

- An interdisciplinary team in which different professional groups complement each other's skills and expertise;
- A team comprising different characters and both sexes;
- Including an individual who is familiar with the target group and its life situation.

It goes without saying that forming such an ideal team is not always easy, especially if the training course is being staged by a small institution. In this case it may help to cooperate with other institutions. When we talk about "the trainer" below, what we invariably mean by this is the option of a training team as well.

Skills and Knowledge

The trainer requires a number of fundamental skills and background knowledge enabling him to implement the training course effectively and successfully. A number of these skills are necessary for any training course but assume particular significance when dealing with the socially disadvantaged target group, especially if the latter are carrying the baggage of adverse previous experience with conventional education systems.

From our perspective, the following skills and knowledge are of particular importance for this training concept:

- Sensitivity to cultural aspects (in particular to the target group's social culture);
- Communication skills;
- Moderating and organisational skills;
- The ability to cooperate and work in a team;
- Background knowledge of group dynamics processes;
- The ability to excite and maintain the participants' motivation;
- Observation skills (observing group dynamics and the entire training process;

- The flexibility to adapt the training course to the relevant participating group and its needs;
- Expert knowledge of (interactive) educational approaches;
- Expert knowledge of lifelong learning;
- The ability to encourage participants to get involved and take an active part;
- Knowledge of and methods for planning learning processes;
- Practical experience of staging training courses;
- The awareness of one's own value system.

In summary, our conclusion is that the trainer should have completed basic pedagogical, social or psychological qualification.

Experiences with and Attitude Towards the Target Group

Sensitivity to cultural background is an additional important precondition the trainer should possess. To align the training course with the relevant target group, the trainer requires solid background knowledge of the target group's life situation, needs and resources. If he does not have any personal experience of dealing with the target group, it can be helpful to establish advance contact with someone representing the target group's interests or even to integrate them into the training team. Personal contact should be established with the participants a few days prior to the training course and an interview of sorts organised in which questions can be asked about the participants' specific expectations of the training course.

Based on this, the trainer can develop the necessary empathy for the target group. In order to be able to work effectively with it, the trainer requires a certain degree of sympathy for and interest in the target group and should show tolerance for the participants' life experiences and values. Self-regulated learning in terms of empowerment can only be achieved if the trainer does not foist his own values and perspectives on the participants. Instead, the participants should be engaged with on their own ground and be able to contribute their own experiences.

The trainer can explain his own attitudes and offer new or complementary value concepts but should never present these as

the "only true" point of view. The trainer supports the participants in devising new goals and skills by themselves; he is a sort of coach but not a leader. It seems to us to be very important that the "balance of power" between trainer and participants remains in equilibrium. What this requires is for the trainer constantly to reflect on his own influential position and the socially disadvantaged situation of the participants.

The Trainer's Tasks

The trainer is responsible for the following general aspects of the training course:
- A clearly defined framework and clear and realistic objectives should be made transparent for the participants.
- The trainer should work with the participants' resources and align the training course with their experience and previous knowledge.
- He ought to observe and evaluate the training process and tailor it to the participants' needs if so required.
- The participants should be able to comprehend the training process so that they can appreciate their experiences within the group.
- The trainer should be aware of his role and in particular of his boundaries within the training course context (*e.g.* education vs. therapy).
- Linked to this, he should collaborate with other organisations and, if necessary, make contact with institutions and experts capable of supporting participants with other goals and questions.

THE PARTICIPANTS

Not only the trainer and training course but the participants as well should satisfy certain fundamental criteria:
- So that the participants really can benefit from the training, they need to possess a modicum of capabilities enabling them to interact, comprehend and learn. This means for example that there has to be a certain command of the language in order to ensure communication.

- The participants must be motivated to take part in the training course and exercises. They should be open to learn new things and for the possibility of personal development or change.
- This presupposes that the participants' involvement in the training course is voluntary.
- One aspect which cannot categorically be answered is the question about the group's homogeneity or heterogeneity. A homogenous group may be easier to handle, the course content can be tailored to specific questions relevant to many or even all the participants. In a heterogeneous group, on the other hand, the participants can benefit from their differences and learn from other people's different experiences and knowledge. It seems advisable to maintain a balance between diversity and similarity and thereby take account both of the social learning objective while also enabling participants to feel quickly at home in the group. In the same manner, no one-size-fits-all statement can be made about the participants' familiarity and anonymity. Anonymity affords the participant the opportunity to speak and behave freely without the others having a preconceived opinion about him and without misgivings about how one's behaviour on the training course will affect existing relationships. On the other hand, depending on the target group, participants in a familiar peer group can operate in a more free and less inhibited manner and provide one another mutual support during the training course. The trainer has to weigh up the influence of dependencies and strong social ties within the training group and select the set-up that seems to him to make the most sense in terms of promoting individual development.
- Thought should be given to exclusion criteria before and during training. Depending on what the training course purports to achieve, physical or mental illnesses, dependency, substance use etc may have a counterproductive effect on participation in the training course.

Contract Between the Trainer and the Group

It can be helpful to conclude a contract between the trainer and the participants. This contract defines the training course's overriding goals, states what both parties are to contribute to the training and can lay down from the outset a number of fundamental rules and obligations (*e.g.* regular participation, punctuality or the like). This type of agreement is an initial contribution to ensuring that participants themselves assume responsibility for the training course.

TRAINING CONTEXT

A number of other underlying conditions can influence the way a training course proceeds. The premises are of particular importance.

They should:

- Be readily accessible for the target group (travel costs and distance)
- Be known to the participants and accepted by them
- Provide all the necessary resources for the training course
- Provide for complimentary or low-priced meals and overnight accommodation if required
- Be independent of institutions that the participants associate with other obligations (*e.g.* therapeutic centre, job centre or police station)

Chapter 7

Theory of Motivation in Sports

THE MOTIVATIONAL DYNAMICS OF SPORT

Motivation is an internal energy force that determines all aspects of our behaviour; it also impacts on how we think, feel and interact with others. In sport, high motivation is widely accepted as an essential prerequisite in getting athletes to fulfil their potential. However, given its inherently abstract nature, it is a force that is often difficult to exploit fully. Some coaches, like Portugal manager Luiz Felipe 'Big Phil' Scolari, appear to have a 'magic touch', being able to get a great deal more out of a team than the sum of its individual parts; others find motivation to be an elusive concept they are forever struggling to master.

What is it that makes individuals like the 45-year-old sprinter Merlene Ottey, who competed in her seventh Olympics in Athens 2004, churn out outstanding performances year in, year out? Elite athletes such as Ottey have developed an ability to channel their energies extremely effectively. Indeed, motivation is essentially about the direction of effort over a prolonged period of time.

There are numerous approaches to the study of motivation. Some are based on schedules of positive and negative reinforcement while others focus on an individual's sense of mastery over a set of circumstances. Some of the key findings from recent literature and provide four evidence-based techniques relating to the enhancement of motivation. You will be able to tailor the motivational techniques to enhance your participation

in sport or the performance of others. You will learn that motivation is a dynamic and multifaceted phenomenon that can be manipulated, to some degree at least, in the pursuit of superior sporting performance.

DIFFERENT TYPES OF MOTIVATION

One of the most popular and widely tested approaches to motivation in sport and other achievement domains is self-determination theory. This theory is based on a number of motives or regulations, which vary in terms of the degree of self-determination they reflect.

Self-determination has to do with the degree to which your behaviours are chosen and self-initiated. The behavioural regulations can be placed on a self-determination continuum. From the least to the most self-determined they are amotivation, external regulation, introjected regulation, identified regulation, integrated regulation and intrinsic motivation.

Amotivation represents a lack of intention to engage in a behaviour. It is accompanied by feelings of incompetence and a lack of connection between one's behaviour and the expected outcome. For example, an amotivated athlete might be heard saying, 'I can't see the point in training any more – it just tires me out' or 'I just don't get any buzz out of competition whatsoever'.

Such athletes exhibit a sense of helplessness and often require counselling, as they are highly prone to dropping out. External and introjected regulations represent non-self-determined or controlling types of extrinsic motivation because athletes do not sense that their behaviour is choiceful and, as a consequence, they experience psychological pressure. Participating in sport to receive prize money, win a trophy or a gold medal typifies external regulation.

Participating to avoid punishment or negative evaluation is also external. Introjection is an internal pressure under which athletes might participate out of feelings of guilt or to achieve recognition. Identified and integrated regulations represent self-determined types of extrinsic motivation because behaviour is initiated out of choice, although it is not necessarily perceived to

be enjoyable. These types of regulation account for why some athletes devote hundreds of hours to repeating mundane drills; they realise that such activity will ultimately help them to improve. Identified regulation represents engagement in a behaviour because it is highly valued, whereas when a behaviour becomes integrated it is in harmony with one's sense of self and almost entirely self-determined. Completing daily flexibility exercises because you realise they are part of an overarching goal of enhanced performance might be an example of integrated regulation. Intrinsic motivation comes from within, is fully self-determined and characterised by interest in, and enjoyment derived from, sports participation.

There are three types of intrinsic motivation, namely intrinsic motivation to know, intrinsic motivation to accomplish and intrinsic motivation to experience stimulation. Intrinsic motivation is considered to be the healthiest type of motivation and reflects an athlete's motivation to perform an activity simply for the reward inherent in their participation.

Flow: The Ultimate Motivational State

Mihalyi Csikszentmihalyi, the highest level of intrinsic motivation is flow state. Flow is characterised by complete immersion in an activity, to the degree that nothing else matters. Central to the attainment of flow is a situation in which there is a perfect match between the perceived demands of an activity and an athlete's perceived ability or skills. During flow, self-consciousness is lost and athletes become one with the activity. For example, a World champion canoeist I work with often describes how the paddle feels like an extension of her arms while she is in flow.

An overbearing or unrealistic challenge can cause excess anxiety, which means that coaches need to ensure that athletes set realistic goals. Conversely, if athletes bring a high level of skill to an activity and the challenge that it provides is relatively low, such as Barcelona and Brazil's Ronaldinho playing in a minor football league, this can result in boredom. To promote flow, it is important to find challenges that are going to stretch athletes just a touch further than they have been stretched before.

Recent Motivation Research based on SDT

A study examining the relationship between athletes' goal orientations and their levels of intrinsic and extrinsic motivation indicated that British collegiate athletes with task-related or personal mastery goals were far more likely to report high self-determination than athletes with ego-orientated or social comparison-type goals. The study provided tentative support for the proposition that focusing on personal mastery and self-referenced goals promotes intrinsic motivation to a greater degree than focusing on winning and demonstrating superiority over others.

This has important implications for practitioners who work with children, given the wealth of evidence that suggests that a focus on personal mastery and intrinsic motivation brings the most positive motivation outcomes. A very recent study showed that during competition deemed to be important, intrinsically motivated athletes developed task-oriented coping strategies. Conversely, extrinsically motivated athletes tended to avoid dealing with key issues and were far less likely to achieve their goals. In another study, researchers adopted a qualitative approach to answer the question 'why does the "fire" of elite athletes burn so brightly?'. They sought to demystify the differences between high achievers and also-rans in the world of sport.

Their interviews with 10 elite Australian track and field athletes revealed three overarching themes:
1. Elite athletes set personal goals that were based on both self-determined and extrinsic motives;
2. They had a high self-belief in their ability to succeed;
3. Track and field was central to their lives – everything rotated around their involvement in the sport.

Using a statistical procedure known as 'cluster analysis', colleagues and I have identified two types of 'motivation profile'. The first was characterised by high levels of both controlling and self-determined types of behavioural regulations and the second by high self-determined and low controlling motivation. A comparison of the two profiles on the motivation outcomes of enjoyment, effort, positive and negative affect, attitude towards sport, strength and the quality of behavioural intentions,

satisfaction, and frequency of attendance showed that participants in the first profile reported higher levels on all eight positive consequences when compared to those in the second profile. This finding suggests that the simultaneous presence of high extrinsic and high intrinsic motivation is likely to yield the most positive benefits for adult athletes.

However, it is critical that extrinsic motives are nurtured on a firm foundation of high intrinsic motivation. Without high intrinsic motivation, athletes are likely to drop out when they encounter problems such as injury, non-selection or demotion. We conducted a follow-up study confirming the profiles identified in 2000 and came up with a similar solution using a new sample of adult athletes. Importantly, we found that participants in cluster 1 also reported better concentration on the task at hand.

ACHIEVEMENT AND MOTIVATION IN SPORTS

ACHIEVEMENT MOTIVE

Striving for success is often seen as a manifestation of an achievement motive (or motivation), something that induces a person to direct his or her behaviour towards the attainment of certain goals. Motive is from *motus,* Latin for move. When that motive becomes established in a set of moral principles and regarded as a virtuous rule of conduct, it becomes an achievement ethic. The whole field of sports is guided by an achievement ethic: victory is sought after and defeat is to be avoided in every endeavor. Competitors are energized by an achievement motive in the sense that they personally seek success rather than failure and are prepared to defeat others in their pursuit of that goal. The motive and the ethic coexist, of course: were victory and the striving for it not seen as worthy, the motive to pursue it would have little purchase. As it is, sports have prospered in cultures that have honoured success.

It is no accident that cultures that extol the virtues of competition and rivalry have produced high achievement-motivated individuals who excel in sports. There is unlikely to be an achievement motive at an individual level outside cultures that do not value success over failure. The influential research of John

W.Atkinson—especially with D.C.McClelland, R.A.Clark and E.C.Lowell, in *The Achievement Motive,* published in 1953—sheds light on the composition of the achievement motive. It is the combination of two personality constructs: the motive to approach success and the motive to avoid failure.

Atkinson, all humans have both; it is the way in which they combine which affects whether one person will be achievement-motivated. Atkinson's research involved testing subjects for both the motive to succeed and the motive to avoid failure. For example, would they look for challenges, show persistence, remain unafraid to lose and blame themselves when making the attribution for success or failure?

Or would they try to avoid failure, dodge challenges—preferring to compete against easy opponents—dislike being evaluated by others and attribute their performance to external factors, such as luck or hard opponents? Those who scored big on the first scale were said to have an achievement motive. Situations also factor into Atkinson's model, which rates probability of success from 0 (no chance) to 1.00 (certainty) and builds in an incentive value (the lower the chance of success, the greater the incentive).

An achievement-motivated kicker faced with a 50-yard field goal chance to win a game and no time left on the clock would relish the opportunity A kicker without a strong motive would prefer either an easier, more certain task, such as a 25-yard attempt, or an impossibly tough kick from outside field goal range to avoid being blamed for the failure.

So the type of situation determines whether the behavioural tendencies of the achievement-motivated player will come to the fore. As many situations in sport have a mid-range chance of success without a very high incentive value, the high achievement-motivated athlete is not always an asset; many situations demand a more conservative performer—a 'safe pair of hands.' M.L.Maehr and J.G.Nicholls rejected many of Atkinson's assumptions about the invariance and objectivity of success and failure. Instead, they proposed that they are much more subjective, based on the perception of reaching or not reaching goals. In other words, success and failure will be viewed differently in different cultures.

While they do not examine the relationship between the achievement ethic and the achievement motive, Maehr and Nicholls acknowledge that it is necessary to understand the meanings of achievement rather than assume there is a single definition that holds good for all. Their interest was in exploring how, for example, winning may be the only criterion of achievement for some, while pleasing a coach by performing well may constitute achievement for others. Different goals give rise to different perceptions of success and failure. But, significantly, all individuals use goals of some kind to evaluate their achievements.

Achievement goals can be grouped into three kinds, just as to Maehr and Nicholls:

1. To demonstrate ability;
2. To be task-involved (mastering a competence rather than assessing oneself against others);
2. To seek social approval. The same competitor may have a different goal for each different sport, or at different times in his or her life, or may even have several goals at once.

Michael Jordan was presumably motivated to achieve a successful outcome during his basketball career but, while his venture into baseball was generally considered a failure, he may well have set himself a different goal, perhaps to master the sport rather than win anything.

Chapter 8

Sports and Environment

PERSONALITY AND SPORT

Despite popular opinion, no distinguishable "athletic personality" has been shown to exist. That is, no consistent research findings show that athletes possess a general personality type distinct from the personality of nonathletes. Also, no research has shown consistent personality differences between athletic subgroups (*e.g.*, team athletes vs. individual sport athletes, contact sport athletes vs. non-contact sport athletes).

Research has identified several differences in personality characteristics between successful and unsuccessful athletes. These differences, however, are not based on innate, deeply ingrained personality traits but rather result from more effective thinking and responding in relation to sport challenges as well as higher levels of motivation.

Specifically, successful athletes, compared with less successful athletes, are:

- More self-confident,
- Better able to cope well with stress and distractions,
- Better able to control emotions and remain appropriately activated,
- Better at attention focusing and refocusing,
- Better able to view anxiety as beneficial,
- More highly determined and committed to excellence in their sport.

Olympic and World champion athletes have defined mental toughness as the natural or developed psychological edge that enables you to cope with competitive demands and remain determined, focused, confident, and in control under pressure. These athletes identify the following as critical personality responses that represent mental toughness: loving the pressure of competition, adapting to and coping with distractions and sudden changes, channeling anxiety, not being fazed by mistakes in the process, being acutely aware of any inappropriate thoughts and feelings and changing them immediately to perform optimally when needed, using failure to drive yourself, learning from failure, and knowing how to rationally handle success—an impressive list of qualities that we all would like to have as part of a mentally tough personality.

Although most sport personality research has focused on the influence of personality on sport behaviour, research has also examined the effects of sport participation on personality development and change. A belief commonly held in American society is that sport builds character or that sport participation may develop socially valued personality attributes. Research shows, however, that competition reduces prosocial behaviours such as helping and sharing and that losing magnifies this effect. Sport participation has been shown to increase rivalrous, antisocial behaviour and aggression and has been linked to lower levels of moral reasoning. Nevertheless, the sport story has a positive side. Research in a variety of field settings has demonstrated that children's moral development and prosocial behaviours (cooperation, acceptance, sharing) can be enhanced in sport settings when adult leaders structure situations to foster these positive behaviours. Interventions with children were successful in building character when naturally occurring conflicts arose and were discussed with the children to enhance their reasoning and values about sport and life events. The moral of the story is this: Sport doesn't build character, people do.

PERSONALITY AND EXERCISE

As in sport, researchers have found no "exercise personality" or set of personality characteristics that predict exercise adherence.

Exercisers cannot be differentiated from non- exercisers based on an overall personality type. Two personality characteristics, however, are strong predictors of exercise behaviour. Individuals who are more confident in their physical abilities tend to exercise more than those who are less physically confident. A second important predictor of exercise behaviour, obviously, is self-motivation, with self-motivated individuals beginning and continuing exercise programmes and less motivated individuals dropping out or never starting at all.

A personality type termed "obligatory exercisers" describes individuals who participate in exercise at excessive and even harmful levels. For these individuals, exercise becomes the central focus of life, and their behaviour becomes pathological in terms of their need to control themselves and their environment. Clinical evidence demonstrates a similar link between anorexia nervosa, a psychopathological eating disorder, and compulsive exercise. Specialists in exercise psychology attempt to help individuals plan and engage in exercise behaviour that is healthy and non-controlling to enhance total well-being.

Echoing the idea that sport builds character, exercise or fitness training has also popularly been associated with positive personality change and mental health.

The personality characteristic that researchers have most frequently examined in this area is self-esteem. Self-esteem is our perception of personal worthiness and the emotions associated with that perception. Think of self-esteem as how much we like ourselves. Research has generally confirmed that fitness training improves self-esteem in children, adolescents, and adults. Research has also shown that exercise positively influences perceptions of physical capabilities, or self-confidence. Interestingly, the research indicates that these changes in self-esteem and self-confidence may result from perceived, as opposed to actual, changes in physical fitness. In addition, many aspects of intellectual performance have been related to physical activity, suggesting that cognitive functions respond positively to increased levels of physical activity.

Many people also associate exercise with changes in mood and anxiety. Most individuals say that they "feel better" or "feel

good" after vigorous exercise, which emphasizes the important link between physical activity and psychological well-being. In addition, research documents that anxiety and tension decline following acute physical activity. The greatest reductions in anxiety occur in exercise programmes that continue for more than 15 weeks. Much research has been conducted to determine whether exercise or fitness reduces people's susceptibility to stress, and the generally accepted conclusion is that aerobically fit individuals demonstrate a reduced psychosocial stress response. A tentative explanation for this finding is that exercise either acts as a coping strategy that reduces the physiological response to stress or serves as an "inoculator" to foster a more effective response to psychosocial stress.

Prolonged physical activity is also associated with decreases in depression and a lessening of depressive symptoms in individuals who are clinically depressed at the outset of the exercise treatment. Explanations for these changes range from the distraction hypothesis, which maintains that exercise distracts attention from stress, to other explanations that focus on the physiological and biochemical changes in the body after exercise.

PERSONALITY WITHIN SPORTS

The mind is one of the most important things to an athlete, as it is one of the greatest strengths they have and it can dramatically affect their performance; this is why personality is one of the biggest influences in sport.

Your personality is your attitude, feelings and how you react to various situations within life; this gives you your unique perception of the world around you, what you do and how you react to this. Your personality is build up of your psychological core, which gives you your basic and simple aspects of personality, so your likes and dislike; these cannot be rewritten, but through life it does grow. You then have your typical response which is partially rewritable and evolves; this is your attitude, so how you generally react based upon your beliefs and opinions concentrated within your psychological core. Finally there is the role related behaviour which is your specified behaviour based on your suited role; this means it is the controlled and restricted personality of

the individual based upon the role they are taking. It is these three factors which make up the personality of a person.

There are two main personality types which roughly defines everyone, this affects various aspects of their personality, but this is especially within athletes. The two extremes are introverts and extroverts.

Introverts are commonly the people who rely on themselves and do individual sports, or have a position which reflects this personality type. Introverts are generally independent, more intelligent, timid, practical, self-assured and serious as they are self dependent.

Extroverts are typically more relaxed, trusting, group dependent and less intelligent; this is because they rely on others during their sport, or in their everyday life.

Although these are two extremes of the types of personalities, the majority of people have aspects of both types, but will generally sway one way. An example of this is that introverts can also take part in some team games; however, they will almost always be put in a position that suits this personality *i.e.* a position that does not involve as much team work.

As personality is important within sport to aid the motivation and ability of the athlete, it is important to understand not just what a personality is, but also how it is developed.

Personalities are believed to be developed in various ways as there are many theories. However, there are three theories which stand out from the others, and most of these other theories are derived from these three.

One of these theories is the Trait theory. The Trait theory predicts that the personality of one's self is not influenced by their surroundings, but instead by the inherited personality of both parents, within the passing on of genes. The theory states that someone's personality cannot be changed and that people are fixed in their ways; this means that our personalities are determined simply by what your parents have each inherited from their parents (etc).

According to this theory it means that experience will not change our personalities; this means that someone will repeat their behaviour in the same situation. Due to this it means that

someone's behaviour/attitude and personality becomes predictable as the role-related behaviour, typical behaviour and psychological core stay the same throughout a person's life. The problem with this theory is that people do in fact adapt to their surroundings and situations, as we make mistakes and learn from them; however, some people do find it harder or near impossible to change or adapt their personality. The theory also suggests that we merely inherit the personalities of our parents; although this still makes us unique it makes our humanity very limited as we are not as adaptable as people think. The theory is also criticised as children are taught to behave and they adapt to that as it is what they are taught, similar to how athletes are trained through discipline etc.

Another theory discussing the origin of our personalities is the Social Learning theory; this theory hypothesises that we learn through interacting with the people around us by analysing their personality at a subconscious level then seeing how they react to stimulus's/situations and copying them to develop our own unique personality. According to this theory it means that the psychological core develops and that then affects the typical and role-related behaviour as they are constantly adapting to develop their personality to their situations. By having the personality adaptable, the person is therefore able to adapt to the same situation or something new by using previous experiences to help them make a personally rational decision.

Although this theory seems more accurate, as we can learn from our mistakes, people sometimes do appear to inherit some traits or how their mind analysis and interprets things from their parents, as they have a similar understanding of things. However this could be said that it is because of the upbringing and the duplication of aspects of the parent's personalities through socially learning, but it could also be through inheritance of the genes as genes do play a part.

The final theory of personality development is the Interactional Approach theory; this theory is a concoction of the previous theories. The mixture states that you inherit characteristics and then your personality develops over time through socialisation; this means that people's personality will change and develop depending on how they have lived, for

example they will learn from their mistakes. However, they are still influenced by the mixture of their parent's genes, hence inheriting parts of their personality.

Although this theory has the strengths of the other two theories, it also has its weaknesses. Despite being proved that we do inherit our parent's genes and that we do learn from our mistakes/situations, it contradicts the social learning theory that says that we have a blank canvas when we are born; which some people believe is true.

From these theories and from reading various articles on the subject I have developed my own theory. Despite being similar to the Interactional Approach Theory, it is more in depth and its development is better explained.

My theory states that there is a blank canvas for the personality, this canvas is then developed by socially learning. The learning that we take part in is natural as our brain absorbs information detailing and acknowledging our surroundings and the behaviour of others, most of which will come from the people you see the most or have the most influence over you (*i.e.* your parents, and then in later years, your role models). However, this is defined by a primitive/animalistic core which causes curiosity and a very minor behavioural personality; this is the blank canvas, as the canvas has to be made of something which will then affect the final portrait.

The basic core gives an infant something that resembles a personality, but a very basic one as they do not know any better; it is simply our brains trying to interpret the data it is taking in while the natural instinct within this core controls its main functions. As the infant grows and the brain develops, it becomes more and more influenced by the people surrounding them, this means they then socially learn which causes the individual to develop their psychological core, and then, as they grow, the rest of the layers of their personality.

As much as socially learning is the main source of developing a personality, the various genes which influence the primitive behavioural instincts do vary; this is because these are passed on genetically as they are the basic and most simple instructions given by the brain *i.e.* to eat, drink. excrete and to interact to survive.

Although the parents mixed genes will create a unique individual, this is only a temporary core and simple instinct (a demonstration and basis for them to create their own); this is before their minds start to develop their own psychological core.

So this primitive core is not their personality per say, it is just a natural reaction based upon the basic instructions of the brain of how to react to stimulus's, taken from the genes of their parents. However, this primitive core does not completely disappear, after all they are the building blocks and the centre of their entire consciousness. As the brain develops these genes make their brain more susceptible to certain areas when analysing their experiences and developing their own personality, so they are more likely to notice, remember or copy specific behaviour as they have already had that in the example from their parents.

According to this theory, it means that a person's personality is developed due to their socialisation, but that personality is aided and defined further, especially at first, as they start to create the psychological core. Due to the development of this new core it will overlap the primitive core and move them further away from their natural origins/primitive behaviour, as this is then a much stronger influence to their decisions and reactions to stimulus's/situations throughout their life.

Although having these genes do mean that some people may be more susceptible to develop certain traits within their personality, this is a very minor factor and would not cause a great change, as the person's experiences affect them more due to the natural ability for humans to analyse and adapt. These theories, along with everything psychology related, can all be applied to sport. For example the decisions made within sports by their coaches *i.e.* positions played, how to communicate with the athlete and how to work efficiently with them. However, this is dependent upon which theory the coach or player most likely favours/believes in.

If a coach was selecting a team from a group of players, if they believed in the trait theory then that would affect their decision as the coach may know the players parents so they would judge their personalities as they would think that the player would inherit those traits or not progress any further than they have already.

However, if the coach believed in either the social learning theory or the interactional approach theory, then they would look at the individual players and judge them as they can teach them how to behave appropriately (etc.) and see who has the most potential and who he/she can manage.

Although the individuals personality does matter, due to the need for respect and honouring the rules, personality also matters when choosing a position or the sport they want to participate in. When the coach chooses a position in a sport, they will place somebody in that position based not only on their performance and skill, but their personality as well *i.e.* whether they are an introvert or an extrovert.

As described previously, an introvert is more independent and adapted to relying on themselves. Although introverts are commonly known to do solo sports, they can do team sports as well. In the cases where they do team sports they are more likely to play a position that is reliant upon themselves, or where they do not have to work with others as much. For example, an introvert would be placed in goal, as they are away from the main game and the responsibility is solely on them; this means that it suits their personality and they will feel more comfortable playing in that position.

An introvert is unlike an extrovert as the extrovert would rather rely on others and work with people more; this means that they would be part of the team, so they would be strikers in football, or part of the pack in rugby during the scrum.

CRITERIA FOR THE SUSTAINABLE DEVELOPMENT OF SPORT

The model of sustainable development consists in reconciling the improvement of economic and social living conditions with the long-term protection of the natural basis of life in order to also give future generations the opportunity to unfold. It not only addresses governments, but also business and industry, all social groups and, indeed, each individual citizen.

When applied to sport, it becomes necessary to:
- Promote and further develop forms of sport which are compatible with nature and the environment;

- Make sports-related infrastructure more environmentally compatible;
- Reduce damage to vulnerable areas;
- Secure and improve opportunities for sport and physical activity outside vulnerable areas;
- Preserve and increase the recreational quality of countryside and its enjoyment value for those doing sport.

AREAS OF ACTION

This paper limits itself to outlining central areas of action. The areas of action are linked to one another in a variety of different ways; considering them in isolation fails to do justice to the complexity of the relationships. Therefore, occasional overlaps in content are unavoidable.

Sports Activities in Nature and the Countryside

Sport and nature conservation can be reconciled almost everywhere. Thus conflicts arising from sports activities in nature and the countryside are not a general problem. They seldom arise on a large scale, but tend to be concentrated in specific locations, which are characterised by their special attractiveness for sport, as well as by a particular vulnerability and the need for nature protection.

Critical factors with respect to the effect of sports activities on nature are the extent, intensity and type of sport being pursued as well as the resilience of the natural area being used. In principle, the use of nature for the purposes of sport should stop at the point where the type of activity concerned considerably affects or damages nature or the rural landscape. Thus sports activities should take into due account the degree of ecological resilience of the area concerned.

In order to reduce the damage to vulnerable areas early on and at the same time fulfil the task of providing for recreation, nature conservation bodies and representatives of sport should be more involved in the planning of opportunities in resilient landscapes. A positive impact on the recreational value of countryside is generated as a side effect of the various nature conservation programmes on species and biotope conservation.

In the past, some countries have developed promising approaches all in the planning and management of sports and leisure activities. These are essentially aimed at ruling out, or avoiding as far as possible, potential conflicts and lessening existing conflicts. Numerous regulations that have been put into practice and proved successful show that they can meet the demands of both sport and nature conservation.

For example, leisure activities and facilities that are not tied to a particular natural environment or geographical features should be removed from vulnerable areas and transferred to less vulnerable areas of manmade landscapes or situated near residential areas. A wide range of measures such as signposting, shifting car-parks, banning traffic from certain roads, information boards, route marking, maintaining desirable routes and closing down undesirable routes, setting up obstacles such as water-filled ditches or bushes all make it possible to transfer activities from vulnerable to more resilient areas without this being noticed by the people concerned. Supplementary measures towards the restriction of activities to certain periods of time could be planned.

In many cases problems only arise when the same areas are used excessively at the same time. Before the use of such areas is banned altogether, the possibility of restricting numbers of visitors to these areas should be examined, while taking into account social fairness. In order to avoid inadequate enforcement, planning possibilities involving the restriction of infrastructure should be considered. In cases where the pursuit of sports activities causes harm only at particular times, restrictions during these specific periods should be considered. In this way, nature conservation requirements during the breeding or moulting season of birds or vital periods for other animals can be respected without banning access to areas at other times.

It is also possible to reconcile sport with nature conservation by defining maximum permissible group sizes, restricting activities to those which do not pose any threat in the specific situation, declaring certain areas of countryside off-limits, stipulating specific routes, defining maximum permissible boat lengths or permissible type of power source or imposing the requirement of producing specific qualifications.

Voluntary commitments should be given priority for achieving conservation aims as they provide greater clarity for those involved. If this is not possible or proves unsuccessful, a wide variety of different solutions should be implemented. It is the duty of sports organisations and commercial operators to encourage a considerite attitude to nature and the environment by providing information about ecological aspects. However, environmental education processes will only be effective it all those involved are willing to respect the restrictions and acquire knowledge of nature conservation issues.

Restrictive measures intended to protect vulnerable or over-used natural areas are successful particularly when attractive alternatives are offered.

These should involve upgrading the land concerned in terms of the aesthetic appeal of the landscape, ecological and recreational aspects, as well as selecting locations which avoid the generation of high traffic volumes. Artificial facilities for types of outdoor sport which take place in nature or the countryside provide only partial relief.

They do not provide a substitute for the experience of nature and may in the long term even serve to increase the use of and thus the pressure on nature.

The measures suitable for avoiding and resolving conflicts arising in connection with types of activities pursued in the countryside can be summarised as follows:

- Developing binding, uniform and effective regulations in areas which, for the sake of nature conservation, must be kept free of any use or certain uses
- Developing and testing effective measures, *i.e.* measures which can be conveyed and controlled, below the level of a ban
- Shifting activities and facilities to less vulnerable areas
- Concentrating and managing activities (in terms of location and time)
- Targeted expansion of supply-oriented planning in resilient areas where the countryside should possibly be enhanced
- Creating artificial alternative and substitute facilities

- Obliging all sports operators to organise their events and programmes such that they are compatible with nature and the environment
- Systematically informing and educating people practising sport and multipliers about the possibilities for pursuing activities without affecting nature or the environment

SPORT AND PHYSICAL ACTIVITY IN BUILT-UP AREAS

People who pursue recreational sports activities in nature and the countryside mainly come from the towns. Both recreational traffic and the activities themselves can cause considerable damage to the environment. If towns offer more suitable opportunities for games, sports and physical activities, it will be possible to ease the pressure on the countryside. Furthermore, tying more people to the area where they live will help to lower environmentally harmful traffic volumes. To this end, ways must be sought to better satisfy the need for physical activity in the vicinity of residential areas.

In order to solve the growing problem of traffic in towns, the aim should be to set up residential structures that put less pressure on people to be mobile. A multifunctional approach to town planning gives rise to "towns with short distances". When it comes to providing residents with sports facilities, this means that adequate and attractive opportunities for sports, games and physical activities for all age groups must be created or preserved in the vicinity of their homes. These opportunities should be linked to one another via green belts with foot and cycle paths. The "strategy of environment-friendly accessibility" is of utmost importance for areas in the local neighbourhood offering basic opportunities for games, sports and physical activities. If central areas suitable for games and sports can be easily and safely reached by bicycle or public transport by the residents of a large catchments, area, this will reduce ecological damage due to traffic and cater for the needs of children, the disabled, the elderly and other groups which do not have regular use of a car.

The environmental and recreational quality of towns is becoming increasingly important as a "soft" location advantage.

Only very cautious adjustments are required to semi-natural areas such as these in order to make them useful. Here there is ample scope for linking aims of nature conservation and recreation by providing semi-natural areas which promise excitement and adventure. It is also possible to put buildings and land to other uses and thus provide facilities for sports and physical activities without taking up additional land. Redesigning or restructuring former industrial buildings and estates, for example, opens up opportunities to improve the range of recreational facilities available in a region.

Earmarking sufficiently large green areas in towns is not only in the interests of sport ("sports-friendly town"), but also of environmental protection ("environment friendly town"). In the tough battle over different land uses, the representatives of sport and those of the environment should join forces to set up a common lobby for more green areas.

Sports Facilities

Sports facilities affect the environment in a variety of different ways. When describing and assessing them, a distinction can be made between indoor and outdoor facilities. Compared to sports halls, outdoor facilities require much more space. How this space is treated is of considerable significance to the environment. On the one hand, the wrong choice of location, improper care (over-fertilization, irrigation using drinking water, etc.) and unnecessary soil sealing can cause the loss of valuable habitats and affect the soil and the water balance. On the other hand, if environmental criteria are taken into account during the planning, building and maintenance of an outdoor sports facility, especially in conurbations, this can upgrade the area ecologically (biodiversity, microclimate etc.) and thus increase the attractiveness of the residential environment.

Sports halls require only about 5 per cent of the area taken up by outdoor facilities. Excessive energy consumption and water use are the prime causes of environmental damage in the case of sports halls. At present, an average of about 400,000 kWh of energy per year are required for operating one hall in Germany, for instance. Today, reduction of energy consumption in sports

halls is mainly concentrated on heating/hot water supply systems, heat insulation and lighting. Practical examples show that there is considerable potential in sports facilities for saving energy and water. In order to exhaust this potential, modern, resource saving technology must be installed and user habits must be changed. Due to the large savings made as a result, investments in energy and water often pay off within relatively short periods. Building renovation, necessary in any case, and new building plans provide ideal opportunities for installing environment-friendly technology.

If environmental aspects are to be considered regularly and not just sporadically, operators of sports facilities need systematic environmental management. Essential elements of such management include the appointment of an environmental officer, mandatory consideration of environmental aspects when any decision is made, the introduction of eco-controlling, as well as regular environmental training courses for staff. By saving valuable resources, sports facilities designed and run on an environmentally compatible basis can contribute enormously towards sustainable development and thus also to the implementation of Agenda 21. This applies in particular to climate protection through reduction of CO_2 emissions.

To summarise, the following steps are important for making sports facilities more ecological:

- Initiating and supporting green consulting services for sports facility operators
- Tying government and association funding for sports facilities (grants and loans) to the fulfillment of environmental standards
- Considering to a greater extent the possibility of making use of existing areas and buildings for sports facilities
- Incorporating environmental management into the work of sports administrations, clubs, associations and commercial sports operators

Sport and Mobility

Just as in other social sub-systems, mobility requirements in sport have increased significantly over the past years. The reasons are manifold. Sport has not only grown in general–another important development is the constant growth in diversity. New

types of sport frequently generate the need for a greater range of different facilities. Reaching new locations (sports facilities or country areas) demands greater mobility.

This is particularly true in the case of activities pursued in nature and the countryside, to which soaring numbers of people have been drawn over many years. Since most people have to travel short or long distances in order to pursue these kinds of activities, sports and tourism are today more closely linked than ever before. Nowadays, sport is often even the principal reason for travel (*e.g.* skiing holidays), and in other cases the activities offered are at least an important factor in the choice of travel destination,

Even in built-up areas, people pursuing sports activities are required to be more mobile. This is mainly due to the geographical separation of working, living and leisure. In particular, the fact that sports and leisure centres are increasingly built on the periphery of towns (in green suburbs) has increased the distance to and from sports activities. However, sport is not only to be found in sports facilities, but, particularly in the towns, in public areas too (parks, play areas in streets, cycle paths etc.) Due to other priorities in town planning over the past decades, there is now a shortage of such options. Opportunities for physical activity, games and sports have been pushed out of town life by new roads and streets, land sealing etc, and this has resulted in people looking more than ever beyond the towns for the recreational facilities they need.

The sustainable development of sport requires not only the avoidance of unnecessary traffic, but also provision and use of means of transport that are the least harmful to the environment. The goal and the reality are still very far apart. Mobility in sport today is primarily "auto mobility". Sport thus contributes considerably to traffic volumes and thus also to climate change. Already, more than half of total distances travelled by cars are travelled during leisure time, of which in turn, just as to a Swiss study, 25 per cent are linked to sport.

With respect to sports activities pursued in the country, two of the main reasons for the high level of private car use are the considerable requirements regarding equipment and transport and the difficulties when using public transport, particularly the limited

possibilities for taking along sports equipment, the lack of transfer facilities between stations and actual destinations, and the fact that routes and frequency of buses and trains are inadequate considering the leisure time demand. Amazingly, however, even in the case of sports activities pursued in built-up areas, private cars seem to be the absolute number-one means of trans-port, Just as to a study carried out at the University of Bayreuth (Germany), three quarters of organised adult volleyball players' travel to their training sessions and home matches by car or motorbike. 55 per cent of the distances in question, however, are 5 km at the most. Sports associations and clubs are thus called upon to create the necessary structures for more environment-friendly mobility on the part of their members and to encourage their members accordingly to change their habits.

To achieve environment-friendly mobility in sport, the following should be given priority:

- Enhancing the residential environment and expanding opportunities for sport, games and physical activity in public areas within the urban area
- Encouraging the use of bicycles (linking sports centres to local cycle path networks, setting up safe places to park bicycles at sports facilities etc.)
- Making buses and trains more attractive as a means of transport during leisure time (routes, timetables, fares, possibilities for transporting sports equipment) etc.
- Improving hiring and storage facilities for sports equipment at the place of destination
- Increasing the awareness of those doing sports (coaches and instructors setting an example, lift-sharing etc.)

Sports Equipment

The growth of sport and its continuing diversification into new kinds of activity, particularly in the 1980s, led to an explosion in the market for sports articles. Sports articles today consist of mass products.

Environmental damage can occur at any stage of the life cycle of a sports article, namely during the acquisition of raw materials, preproduction, actual production of the article, sales, use and

disposal. Until now, so-called end-of-pipe strategies have been predominant in the sports article industry: these strategies focus on the subsequent reduction of pollution that has already occurred.

The development of new sports equipment revolves almost solely around aspects of function and fashion. Environmental aspects play a role only in exceptional cases. For the sake of greater functionality in sports articles, materials are often used which cause substantial ecological damage even at the time of manufacture, or which cause problems at the latest when they are disposed of. The latter applies particularly to so-called composite materials, which as a rule cannot be recycled back into the original materials.

Supply and demand influence each other in the sports article industry too. On the one hand, the industry has adapted its products to the serious changes in sports and leisure and responded to the consumer's changed preferences.

On the other hand, the industry has helped to shape sports trends and consumer behaviour by means of new and ever more spectacular products. Against this background, marketing sports equipment without paying heed to the environmental damage it causes and advertisements showing behaviour that is damaging to nature and even, in some cases, unlawful are particularly problematic.

A more environmentally aware approach in the sports article industry should centre on preventative rather than simply corrective environmental protection measures. This means giving (in the future) ecological aspects high priority even at the product development stage. The main aims should be to minimise negative environmental effects in the life cycles of all products and to promote substance cycles. Here, the use of recyclable materials is especially important as is unmixed production and the easy separability of materials used. It is not possible to create substance cycles simply through the activities of sports equipment manufacturers. Instead, there must be very close cooperation between manufacturers, suppliers and dealers. Such cooperation is an absolute prerequisite for the production of recyclable products and the development of a functional collection and recycling system.

The key steps towards greater environmental compatibility in the sports article industry are as follows:

- Taking ecological aspects (longevity, reparability, recyclability) into account even at product development stage
- Elaborating life-cycle analyses for widespread sports articles
- Checking present possibilities for recycling or environment-friendly disposal of widespread sports articles
- Setting up a system for collecting and recycling sports equipment (when the necessary prerequisites exist)
- No more depiction by the sports article industry (manufacturers and outlets) of environmentally damaging sports activities in their communication with consumers (advertising, PR etc.)
- Setting up functional environmental management systems in companies in the sports equipment sector
- Spreading information on environmentally sound sport via sports dealers

CONCEPT OF ENVIRONMENT

In our society sport fulfils important functions and is indeed indispensable. It offers opportunities for physical activity in a world where physical activity is increasingly diminishing; it promotes good health and well-being; and it provides a means of social contact and ample opportunity for intensive experiences.

At the same time, however, sport can be a considerable cause of damage to nature and the environment. Damage can occur directly as a result of the pursuit of sports activities or the building and operation of the requisite infrastructure, or it can be caused by indirect factors such as the use of cars to travel to and from sports activities.

The causes of the conflict between sport and the environment are inherent in sport itself and are also a consequence of deep-rooted social changes; they may be understood only from this perspective. Since the 1970s, higher income, more leisure, greater

mobility and increasing individualisation have formed the basis for major and continuing changes in sport.

These changes include the following:

- A rise in the number of people who pursue sports activities
- A higher degree of differentiation between types of sport and sports equipment as well as motives and reasons
- The use of areas hitherto unused or seldom used and areas already in use being opened up for new purposes
- Spread of activities to periods previously not or seldom made use of
- Fewer ties with sports clubs and their traditions
- Increase in individual, spontaneous activities without proper training
- Increase in activities offered commercially and to a certain extent associated with aggressive advertising

Consequently, these developments have led to wider and more intensive use of particularly attractive but, by nature, vulnerable areas.

Sport is claiming more territory, and this is continually putting numerous animal and plant species under threat and causing the loss of natural landscapes. Sport can not only affect nature and landscapes, but can also give rise to other environmental damage. With regard to this problem, the use of non-renewable resources, the emission of harmful substances during the building and operation of sports facilities, journeys to and from these facilities, and the production and disposal of sports equipment all play a key role.

Sports activities can cause critical damage to and endanger precious and vulnerable locations. However, in terms of overall damage, sport tends to play a lesser role compared to other causes such as agriculture, forestry, industry and transport. In the analysis of conflicts between sport and the environment, areas of overlap with other forms of land use must be taken into account.

At the same time, sport is also affected by general damage to the environment caused by other sources. Such damage includes, for example, a large number of devaluated watercourses, *e.g.* as a result of hydraulic engineering, pollution of soil and water and

air. Thus, while sport can be an obstacle to issues of nature conservation and environmental protection, the two conflicting areas also have common interests.

New approaches are required for resolving existing conflicts between sport and the environment in the long term. This means orienting conservation and utilisation concepts to the principle of sustainability in line with the agreements reached at the Conference on Environment and Development in Rio de Janeiro in 1992. Sport must be included in the on-going debate on implementation of Agenda 21, which was adopted at the conference. The aim should be for representatives of sport and those promoting the cause of nature conservation and environmental protection to join forces and draw up guidelines for sustain-able development in sport.

ENVIRONMENTAL EDUCATION

Due to the speed at which our natural basis of life is changing, environmental education has become one of the major future tasks of mankind. As far back as 1977, UNESCO declared that environmental education should be an allembracing, life-long process which actively involves individuals in the solution of specific problems.

In sport too, the importance of the "future task of environmental education" is now undisputed. Avoiding and reducing sports-related environmental damage requires the active involvement of those who pursue sports activities. Environmental education should both encourage environment-friendly attitudes and habits among people doing sports and ensure that planning and legal measures for the protection of the environment are widely accepted by generating understanding among people doing sport. Environmental issues have now become part of the curricula of numerous sports organisations.

The purpose of environment- related basic and further training of, for example, instructors and coaches, is intended to lend more weight to environmental education, also as part of the normal work of clubs and associations. The same purpose is being pursued by producing and disseminating information material among club and association members. Although they represent only a certain

proportion of the people pursuing sports activities, sports organisations carry special responsibility as far as environmental education is concerned. They should not only initiate environmental education processes, even reaching beyond the circle of their actual members, but should also be willing to impose constraints upon themselves and to respect limits. Sports associations and clubs and each individual instructor, coach and supervisor should also set an example with respect to ecological issues.

Environmental education is one important approach towards resolving and avoiding conflicts between environment and sport, but is insufficient on its own. More attention should be paid to the fact that educational effects can. be produced by the structure and framework within which the respective sports activity is purr-sued. Thus, information and education should in future be complemented by the creation of conditions which encourage environment friendly behaviour, There is a wide variety of opportunities here, including obliging members to share lifts for away matches, providing containers for waste separation or installing safe facilities for parking bicycles.

To summarise, the following steps are especially important for future, successful environmental education in sport:

- Drawing up and implementing to a greater extent overall concepts for environmental education in which theory and practice are closely linked
- Putting in place the necessary structures for ensuring adequate and high quality environmental education
- Testing models for influencing the environmental behaviour of non-organised sportsmen and sportswomen
- Holding environment-related competitions in sports
- Developing and implementing models for sport compatible with nature and the environment
- Anchoring environmental communication more firmly in the work of associations and clubs and in the dialogue with broad sections of the population

SUMMARY AND OUTLOOK

Sport can make its own important contribution towards bringing about the model of sustainable development and thus to

the implementation of Agenda 21 in all countries. To achieve this, sports organizations and others involved in sport must discuss this model intensively and anchor it firmly in their work.

Rising numbers of users and the greater and more intense use of nature and resources (land, energy, water etc.) have undeniably increased the damage to nature and the environment by sport. At the same time, however, the range of strategies and measures for avoiding and resolving conflicts between sport and nature conservation and environmental protection, is broader than often recognized.

The coordinated combination of planning, educational and legal measures promises to be particularly successful. In the case of nature-based sports, emphasis should be placed in the future on developing differentiated concepts for conservation and utilization with regard to nature and landscape; these concepts should involve the adaptation of the type of sport to the features of the natural area.

Vulnerable areas should be kept free of harmful activities and sports activities should be shifted to less vulnerable but nonetheless attractive landscape. Legal measures should only be taken if the protection objective so requires and other mechanisms do not function.

In built-up areas, the priority is to retain and expand areas near homes for the purpose of physical activity, games and sport. A town offering a good quality of life must offer ample scope for physical activity. When sports facilities are built and operated, attention must be paid to the careful and rational use of resources. In the case of existing sports facilities, it appears that the potential for reducing energy and water consumption is not yet exhausted. In the process of planning and setting up new sports facilities, environmental factors should be ranked higher than in the past.

Sport is responsible for a significant proportion of all leisure traffic. Shortening necessary routes by providing facilities near homes is thus an important starting point for bringing about changes, So far, the main means of transport for those involved in sports has been the car. The environmental damage caused by this is often underestimated. It is therefore extremely important to

develop and increase the popularity of more environment-friendly forms of mobility. Today, sports articles only very rarely satisfy the conditions for ecological product design. Thus it is hardly possible to achieve closed substance cycles.

As closed substance cycle management is a central element of sustainable development, it is also necessary to make changes in this field. In the search for solutions all parties involved must cooperate. This concerns above all sports and nature conservation, commercial sports, politics and administration, trade and industry. Without the constructive collaboration of these groups, it will hardly be possible to find effective and generally accepted solutions.

It is vital that the group concerned in each case become involved at an early stage in the search for solutions to the conflict. However, the active participation of each individual person pursuing sports activities is also necessary.

Thus environment-related information campaigns among people doing sport should be continued and, where appropriate, expanded.

NEED OF ENVIRONMENT IN PHYSICAL EDUCATION PROGRAMME

Physical Education is one of the important ways to improve sports environment. The Physical Education professional can play the main and important role improving sports environment. They should provide theoretical and practical knowledge of Physical Education and Sports so that children learn more and interest for sports and games be created. This will increase participation and will help in improving sports environment in the school.

The individual can be a player, the captain of the team or sports captain of the school. They can motivate other students to play and participate in the games and sports by telling them the benefits of sports. Because motivation by peer group can be real source of energy for improving sports environment.

In this the Physical Education Teachers and Trainers/Coaches play very important role. They shall see that there is no obstacle in the ground. The ground is neat, clean and leveled. The

equipment must be safe. The training should be done in organized manner. Extra attention should be given to injury oriented sports like Cricket, Hockey, Football, Archery, Javelin Throw, Discus Throw, Shot-put etc. The most important is not to leave students unattended. The Physical Education Teacher should be there to provide help at the time of injury or accident that may happen during the game.

Chapter 9

Psychological Skills Training in Sports

DEFINITION OF PSYCHOLOGY AND SPORT PSYCHOLOGY

PSYCHOLOGY

Psychology is a broad discipline which seeks to analyse the human mind. Different disciplines within this field study why people behave, think, and feel the way they do. There are many different ways to approach psychology, from examining biology's role in mental health to the role of the environment on behaviour. Some psychologists focus only on how the mind develops, while others counsel patients to help improve their daily lives. The history of psychology dates back at least to 1879, when the German psychologist Wilhelm Wundt founded the first laboratory exclusively devoted to psychology.

The most famous psychologist is perhaps Sigmund Freud, an Austrian who founded the field of psychoanalysis. Although Freud's theories had a huge impact on a wide variety of areas, including literature and film, many of his ideas are considered subjective from a modern perspective. There are dozens of different sub-disciplines of psychology, with each taking a somewhat different approach to understanding the mind. Some sub-disciplines include social psychology, clinical psychology,

occupational health, and cognitive psychology. It is important to note that, even within a particular field, there may be different approaches. Clinical psychology, for example, has four main schools: psychodynamic, humanistic, cognitive and behavioural, and systems therapy.

The field of psychology is far wider than the image of a patient reclining on a couch, talking to his therapist or a researcher studying a rat running through a maze. A forensic psychologist may help legal professionals investigate allegations of child abuse or evaluate a suspect's competency. A legal psychologist might act as an adviser to a judge or as a trial consultant. An industrial-organizational psychologist might work with a company to help hire the best applicants or help improve workplace morale. A sports psychologist might work one-on-one with a player to help overcome a performance barrier, or work with an entire team to help improve group cohesion.

Psychology should be further distinguished between *research psychology*, which seeks to establish facts about the mind by conducting experiments, and *applied psychology*, which seeks to help people with their problems. Some experiments have shown that the success rate for solving one's problems using only psychotherapy—talking to a professional psychologist—is the same as talking to a close friend, so the efficacy of applied or clinical psychology as a discipline can sometimes be difficult to quantify. Alternatively, many patients report that therapy has been greatly helpful in their lives. As compared to other hard sciences, like physics and biology, some critics argue the field suffers from a lack of scientific rigour.

The objectivity of tools like surveys, through which data is collected in some cases, are often questioned. This is perhaps closely associated with the complexity of the mind which we haven't quite been able to fully or substantially understand. Psychological studies, however, continue to be held in order to try to get a better understanding of the mind and how it works. Fields like neuropsychology, which looks at how the structure of the brain affects mental health, use neuroimaging technology. Tools such as functional magnetic resonance imaging and positron emission tomography (PET) scans have assisted psychologists in

making correlations between mental problems and biological states. For instance, in the 1980s, it was realized the schizophrenia was mainly caused by biological factors rather than maternal neglect or some other environmental explanation.

History

The study of psychology in philosophical context dates back to the ancient civilizations of Egypt, Greece, China, India, and Persia. Historians point to the writings of ancient Greek philosophers, such as Thales, Plato, and Aristotle, as the first significant body of work in the West to be rich in psychological thought.

Structuralism

German physician Wilhelm Wundt is credited with introducing psychological discovery into a laboratory setting. Known as the "father of experimental psychology", he founded the first psychological laboratory, at Leipzig University, in 1879. Wundt focused on breaking down mental processes into the most basic components, starting a school of psychology that is called structuralism. Edward Titchener was another major structuralist thinker.

Functionalism

Functionalism formed as a reaction to the theories of the structuralist school of thought and was heavily influenced by the work of the American philosopher and psychologist William James. James felt that psychology should have practical value, and that psychologists should find out how the mind can function to a person's benefit.

Major functionalist thinkers included John Dewey and Harvey Carr. Other 19th-century contributors to the field include the German psychologist Hermann Ebbinghaus, a pioneer in the experimental study of memory, who developed quantitative models of learning and forgetting at the University of Berlin; and the Russian-Soviet physiologist Ivan Pavlov, who discovered in dogs a learning process that was later termed "classical conditioning" and applied to human beings.

Starting in the 1950s, the experimental techniques set forth by Wundt, James, Ebbinghaus, and others would be reiterated as experimental psychology became increasingly cognitive—concerned with information and its processing—and, eventually, constituted a part of the wider cognitive science. In its early years, this development had been seen as a "revolution", as it both responded to and reacted against strains of thought—including psychodynamics and behaviourism—that had developed in the meantime.

Psychoanalysis

From the 1890s until his death in 1939, the Austrian physician Sigmund Freud developed psychoanalysis, a method of investigation of the mind and the way one thinks; a systematized set of theories about human behaviour; and a form of psychotherapy to treat psychological or emotional distress, especially unconscious conflict. Freud's psychoanalytic theory was largely based on interpretive methods, introspection and clinical observations.

It became very well-known, largely because it tackled subjects such as sexuality, repression, and the unconscious mind as general aspects of psychological development. These were largely considered taboo subjects at the time, and Freud provided a catalyst for them to be openly discussed in polite society. Clinically, Freud helped to pioneer the method of free association and a therapeutic interest in dream interpretation. Freud had a significant influence on Swiss psychiatrist Carl Jung, whose analytical psychology became an alternative form of depth psychology.

Other well-known psychoanalytic scholars of the mid-20th century included psychoanalysts, psychologists, psychiatrists, and philosophers. Among these thinkers were Erik Erickson, Melanie Klein, D. W. Winnicott, Karen Horney, Erich Fromm, John Bowlby and Sigmund Freud's daughter, Anna Freud. Throughout the 20th century, psychoanalysis evolved into diverse schools of thought, most of which may be classed. Psychoanalytic theory and therapy were criticized by psychologists and philosophers such as B. F. Skinner, Hans Eysenck, and Karl Popper. Popper, a philosopher of science, argued that Freud's, as well as Alfred

Adler's, psychoanalytic theories included enough ad hoc safeguards against empirical contradiction to keep the theories outside the realm of scientific enquiry. By contrast, Eysenck maintained that although Freudian ideas could be subjected to experimental science, they had not withstood experimental tests. By the 20th century, psychology departments in American universities had become experimentally oriented, marginalizing Freudian theory and regarding it as a "desiccated and dead" historical artifact. Meanwhile, however, researchers in the emerging field of neuro-psychoanalysis defended some of Freud's ideas on scientific grounds while scholars of the humanities maintained that Freud was not a "scientist at all, but... an interpreter."

Behaviourism

In the United States, behaviourism became the dominant school of thought during the 1950s. Behaviourism was founded in the early 20th century by John B. Watson, and embraced and extended by Edward Thorndike, Clark L. Hull, Edward C. Tolman, and later B. F. Skinner.

Theories of learning emphasized the ways in which people might be predisposed, or conditioned, by their environments to behave in certain ways. Classical conditioning was an early behaviourist model. It posited that behavioural tendencies are determined by immediate associations between various environmental stimuli and the degree of pleasure or pain that follows. Behavioural patterns, then, were understood to consist of organisms' conditioned responses to the stimuli in their environment. The stimuli were held to exert influence in proportion to their prior repetition or to the previous intensity of their associated pain or pleasure. Much research consisted of laboratory-based animal experimentation, which was increasing in popularity as physiology grew more sophisticated. Skinner's behaviourism shared with its predecessors a philosophical inclination towards positivism and determinism.

He believed that the contents of the mind were not open to scientific scrutiny and that scientific psychology should emphasize the study of observable behaviour. He focused on behaviour–

environment relations and analysed overt and covert behaviour as a function of the organism interacting with its environment. Behaviourists usually rejected or deemphasized dualistic explanations such as "mind" or "consciousness"; and, in lieu of probing an "unconscious mind" that underlies unawareness, they spoke of the "contingency-shaped behaviours" in which unawareness becomes outwardly manifest. Among the behaviourists' most famous creations are John B. Watson's Little Albert experiment, which applied classical conditioning to the developing human child, and Skinner's notion of operant conditioning, which acknowledged that human agency could affect patterns and cycles of environmental stimuli and behavioural responses.

Linguist Noam Chomsky's critique of the behaviourist model of language acquisition is widely regarded as a key factor in the decline of behaviourism's prominence. Martin Seligman and colleagues discovered that the conditioning of dogs led to outcomes that opposed the predictions of behaviourism. But Skinner's behaviourism did not die, perhaps in part because it generated successful practical applications. The fall of behaviourism as an overarching model in psychology, however, gave way to a new dominant paradigm: cognitive approaches.

Humanism

Humanistic psychology was developed in the 1950s in reaction to both behaviourism and psychoanalysis. By using phenomenology, intersubjectivity and first-person categories, the humanistic approach sought to glimpse the whole person—not just the fragmented parts of the personality or cognitive functioning. Humanism focused on fundamentally and uniquely human issues, such as individual free will, personal growth, self-actualization, self-identity, death, aloneness, freedom, and meaning.

The humanistic approach was distinguished by its emphasis on subjective meaning, rejection of determinism, and concern for positive growth rather than pathology. Some of the founders of the humanistic school of thought were American psychologists Abraham Maslow, who formulated a hierarchy of human needs, and Carl Rogers, who created and developed client-centred

therapy. Later, positive psychology opened up humanistic themes to scientific modes of exploration.

Gestalt

Wolfgang Kohler, Max Wertheimer and Kurt Koffka co-founded the school of Gestalt psychology. This approach is based upon the idea that individuals experience things as unified wholes. This approach to psychology began in Germany and Austria during the late 19th century in response to the molecular approach of structuralism. Rather than breaking down thoughts and behaviour to their smallest element, the Gestalt position maintains that the whole of experience is important, and the whole is different than the sum of its parts. Gestalt psychology should not be confused with the Gestalt therapy of Fritz Perls, which is only peripherally linked to Gestalt psychology.

Existentialism

Influenced largely by the work of German philosopher Martin Heidegger and Danish philosopher Søren Kierkegaard, psychoanalytically trained American psychologist Rollo May pioneered an existential breed of psychology, which included existential therapy, in the 1950s and 1960s. Existential psychologists differed from others often classified as humanistic in their comparatively neutral view of human nature and in their relatively positive assessment of anxiety.

Existential psychologists emphasized the humanistic themes of death, free will, and meaning, suggesting that meaning can be shaped by myths, or narrative patterns, and that it can be encouraged by an acceptance of the free will requisite to an authentic, albeit often anxious, regard for death and other future prospects.

Austrian existential psychiatrist and Holocaust survivor Viktor Frankl drew evidence of meaning's therapeutic power from reflections garnered from his own internment, and he created a variety of existential psychotherapy called logotherapy. In addition to May and Frankl, Swiss psychoanalyst Ludwig Binswanger and American psychologist George Kelly may be said to belong to the existential school.

Cognitivism

Cognitive psychology is the branch of psychology that studies mental processes including how people think, perceive, remember, and learn. As part of the larger field of cognitive science, this branch of psychology is related to other disciplines including neuroscience, philosophy, and linguistics. Noam Chomsky helped to ignite a "cognitive revolution" in psychology when he criticized the behaviourists' notions of "stimulus", "response", and "reinforcement", arguing that such ideas—which Skinner had borrowed from animal experiments in the laboratory—could be applied to complex human behaviour, most notably language acquisition, in only a vague and superficial manner.

The postulation that humans are born with the instinct or "innate facility" for acquiring language posed a challenge to the behaviourist position that all behaviour is contingent upon learning and reinforcement. Social learning theorists such as Albert Bandura argued that the child's environment could make contributions of its own to the behaviours of an observant subject. Meanwhile, accumulating technology helped to renew interest and belief in the mental states and representations—*i.e.,* the cognition—that had fallen out of favour with behaviourists. English neuroscientist Charles Sherrington and Canadian psychologist Donald O. Hebb used experimental methods to link psychological phenomena with the structure and function of the brain.

With the rise of computer science and artificial intelligence, analogies were drawn between the processing of information by humans and information processing by machines. Research in cognition had proven practical since World War II, when it aided in the understanding of weapons operation. By the late 20th century, though, cognitivism had become the dominant paradigm of mainstream psychology, and cognitive psychology emerged as a popular branch.

Assuming both that the covert mind should be studied and that the scientific method should be used to study it, cognitive psychologists set such concepts as "subliminal processing" and "implicit memory" in place of the psychoanalytic "unconscious mind" or the behaviouristic "contingency-shaped behaviours".

Elements of behaviourism and cognitive psychology were synthesized to form the basis of cognitive behavioural therapy, a form of psychotherapy modified from techniques developed by American psychologist Albert Ellis and American psychiatrist Aaron T. Beck. Cognitive psychology was subsumed along with other disciplines, such as philosophy of mind, computer science, and neuroscience, under the umbrella discipline of cognitive science.
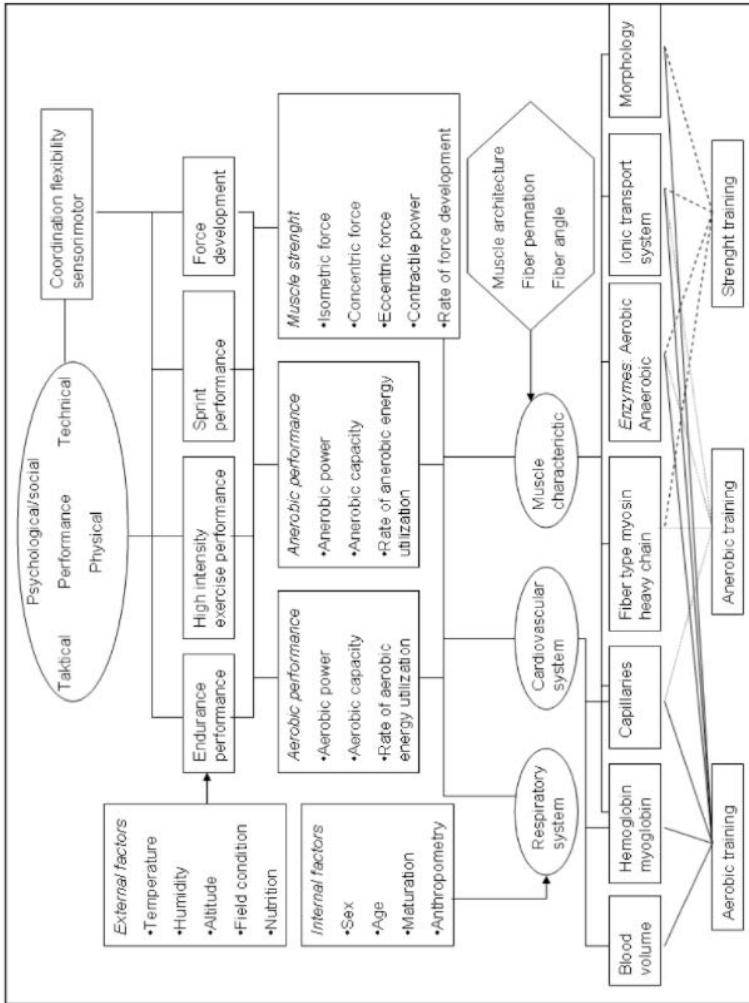
SPORTS PSYCHOLOGY

It has long been acknowledged that psychological skills are critical for athletes at the elite level. Athletes with the requisite "mental toughness" are more likely to be successful. In the past, it was assumed that these skills were genetically based, or acquired early in life. Now, it is commonly accepted that athletes and coaches are capable of learning a broad range of psychological skills that can play a critical role in learning and in performance.

Role of Sports Psychology

The specialised field of sports psychology has developed rapidly in recent years. The importance of a sports psychologist as an integral member of the coaching and health care teams is widely recognised. Sports psychologists can teach skills to help athletes enhance their learning process and motor skills, cope with competitive pressures, fine-tune the level of awareness needed for optimal performance, and stay focused amid the many distractions of team travel and in the competitive environment. Psychological training should be an integral part of an athlete's holistic training process, carried out in conjunction with other training elements.

This is best accomplished by a collaborative effort among the coach, the sport psychologist, and the athlete; however, a knowledgeable and interested coach can learn basic psychological skills and impart them to the athlete, especially during actual practice.

The Medical Staff and Psychosomatic Disorders

The health professional often plays a major role in supporting the emotional health of athletes. An athlete's psychological stresses may be manifested as somatic complaints, such as sleep disturbances, irritability, fatigue, gastrointestinal disturbances, muscle tension, or even injury. Athletes often turn to a therapist or physician for relief, either because they do not recognise the psychological basis of the physical complaint, or because they fear the services of a mental health practitioner due to the perceived stigma, or because no psychologist is available. Therapists must be aware of the possibility of an underlying psychological basis

for a complaint and enquire into the emotional status of the athlete as part of the medical history. Careful, non-judgemental questioning may reveal inter-personal problems with a coach, teammate, family member, or other individuals, or anxiety concerning an upcoming competition. In these situations, a sports psychologist is invaluable. If none is available, the physician or therapist may need to assume the role of sounding board, intermediary, or stress-management advisor. At times, being a patient listener and confidant may be all that is required. If mediation between parties is required, a neutral, non-judgemental stance must be maintained to help the parties air and resolve differences.

Preparing for Competition

Simple psychological skills to help the athlete manage the competitive performance environment include:
- Learning relaxation skills; slow, controlled, deep abdominal breathing; or autogenic training;
- Mastering all of the attentional styles;
- Imagery;
- Appropriate self-talk;
- Developing a precompetition mental routine to be employed immediately prior to competition on game day.

The Injured Athlete

Athletes have a strong sense of body awareness, and take great pride in the capabilities of their bodies. Thus, injuries can be psychologically as well as physically devastating. The ability to train and compete well involves enormous ego. Athletes often identify themselves by who they are as an athlete. Thus, an injury places considerable stress on this self-identification. The more severe the injury, and the longer the recovery-rehabilitation period, the more prolonged and profound the mood disturbance may be.

Injured athletes commonly experience at least three emotional responses: isolation, frustration, and disturbances of mood:
1. The injury forces the athlete to become separated from teammates and coaches. Other team members may

provide little support, and in fact they may shun their injured teammate to avoid reminders of their own potential frailty.

2. The athlete becomes frustrated because he or she perceives the loss of months of training and skills mastery, although there are many instances where athletes have used the recovery period to master mental and other physical skills to return successfully to competition.

3. Mood disturbances are common. The athlete may be temporarily depressed, or become upset by minor annoyances.

An injury can provide the athlete with an opportunity to work with a caring professional to re-assess his or her reasons for being in sport, and for redefining goals in sports participation. The health care team must be aware and include psychological support as an integral part of the treatment and rehabilitation processes. At the outset, the athlete must be fully informed about the nature and severity of the injury, the prognosis for recovery, recommended course of therapy and rehabilitation, and an estimate of the time needed before training can be resumed.

The athlete must be made a full partner in the treatment and recovery process, and given responsibility for therapeutic activities that can be carried out at home. The medical team must discuss openly the psychological changes that accompany an injury, and reassure the athlete that this is to be expected. Reassurance and supportive measures are generally adequate, but a visit from an athlete who has recovered from a similar injury may be of great value.

This entire process can be facilitated by a supportive and understanding medical staff. The formula:

Genuine Caring + Skills + Courage = Positive Outcome for the Injured Athlete.

Referral to a sports psychologist may be necessary if the athlete is deeply disturbed, or if the injury is severe and a prolonged recovery is anticipated. All injuries involve a certain degree of fear and uncertainty, and the sports psychologist may be great value in helping to deal with this emotion.

Table. From Common to Clinical Responses: Gauging Referrals to Therapy.	
Temporary Emotional Responses	**Ongoing Emotional Patterns**
Sadness	Depression
Feeling isolated	Withdrawal Irritated Explosive
Neutral Numb Unmotivated	Apathetic
Frustration outbursts	Frequent crying or emotional
Anger	Rage
Moderate change in appetite disordered eating	Rapid weight loss or gain, or pattern
Minor sleep disturbance	Insomnia

Consider referring to a trained, experienced sport psychology consultant if injured athlete:

- Lacks confidence in his/her ability to recover, or to engage in the rehabilitation process.
- Lacks belief in the rehabilitation process.
- Has difficulty filtering out environmental distractions during rehab or training sessions.
- Is withholding effort out of fear.
- Loses focus easily when pain intensifies or when discouragement sets in.
- Is engaging in excessive cognitive thinking over simple tasks.
- Is unsure of how to set and attain meaningful goals.
- Has trouble controlling thoughts about the injury, or worries about re-injury.
- Is unable to control negative self-talk.
- Desires to maximise the utility of the rehab and wishes to work more intensely on developing his/her mental game.

Athletes Competition Day Preparation

Many athletes use special psychological procedures to prepare themselves on competition day. The following exercises will help you develop your own competition-day routine and achieve that hard-to-define sense of "readiness"—it may be a sense of

"tingling" or the simple subjective feeling that "this is my day." Too high a level of activation is experienced as "stress" or anxiety and leads to muscle tightness, poor efficiency, poor attention or concentration (chaotic thinking or too narrow a focus), and loss of smooth and responsive muscle coordination. Too low a level of activation is seen as low energy, a "flat" performance, little or no motivation, and wandering attention. Both profiles lead to performance errors. How one achieves that sense of readiness that precedes optimum performance varies with each person, so carefully review your best competition days and try to identify the cues (inside of you and in your environment) that seemed to help you prepare to compete well.

Identify your Stress Profile

The next time you experience some type of stress (competition, tests, talking with someone you feel uncomfortable with, etc.), notice how stress affects your body and your mind.

Be very specific:

- *Muscles that tighten*: Jaw clenches, shoulders tighten, fists clench, stomach tightens, other
- *Breathing pattern*: Shorter and faster, rapid speech, other:
- *Gastro-intestinal responses*: nausea or unsettled sensations in the stomach; more frequent bowel movements, other
- *Other physical signs*: Dry throat, upset stomach, cold hands and/or feet, rapid, pounding heart, sweaty palms, frequent urination, other
- *Interpersonal responses*: Rapidity of speech with different people, need to be around certain people (coach, teammate, family, friends, etc.), need to be alone, need to "show them" during warm-up, watching other athletes, other
- *Personal cues*: Mind goes blank (when?), forgetfulness, unable to focus attention well (easily distracted or too narrow a focus), things you say to yourself (I've got to do better this time, what am I doing here? I hope my coach/parents don't get mad if, I hope I don't goof), other

- *Environmental cues*: Air temperature, humidity, rain, crowd noises, officials, poor fit of clothes or shoes, equipment problems

Use this Information to Identify the Early Signs of Stress

Individuals experience stress in consistent ways, and you need to find your own stress profile. Log your responses to stress as well as the cues that were present on your best competition days so that you can compare the two profiles.

Planning for Competition Day

By now you will have some idea of what your stress profile is: when too much or too little stress is activated, WHAT or WHO triggers the stress, and HOW it affects you (both physically and mentally). Once you know the cues that interfere with your performance, you can plan a programme of psychological and physical techniques to help reach a better performance level. Be sure to use psychological techniques in your daily training programme. Like any skill, these techniques require practice before you can use them effectively under pressure.

Also, be sure to keep a log of techniques and routines that help you on competition days:
- Plan for the night before competition: You may wish to use mental rehearsal techniques, but don't use them just before sleep—this is an activation activity, not a relaxation for sleep.
- Day of competition:
  - Know your competition schedule, and plan activities such as eating, reaching the competition site, and getting into the locker room so that there is no sense of rushing. Some athletes become more tense if they arrive too early—find the balance that's right for you. List the time needed to reach the competition site and a schedule you plan to follow.
  - Every 45 minutes–1 hour check yourself for signs of stress and take a minute to do a body check and use stress management/self-regulation techniques that work for you. List the signs of stress and the

specific techniques you plan to use to reduce stress:
If tension is too great for self-control or self-regulation, who (teammate or coach) can help you?
How? Example: Help you check breathing; muscle
check; quietly repeat relaxation phrases; place hands
gently on your shoulders to help lower them to a
more relaxed level; help move away from distracting
noises or scenes to a quieter place, etc.

- Psychological Strategies to Use Before Competition:
  - *Internal Muscle Check*: Review each muscle group
    (standing, sitting, or lying down). Hands, arms and
    fists, forehead, eyes; cheeks and jaw; shoulders and
    upper back; stomach; hips and lower back, thighs;
    lower legs and feet.
  - *Breathing Check*: Inhale and feel slight tension;
    exhale and relax from top of head to knees and toes.
    Feel the relaxation roll down the body. Periodically
    inhale deeply, hold your breath and feel the tension
    throughout your body, then relax your jaw, exhale
    and feel the contrast of the relaxation as it rolls
    down your body. QUICKLY "scan" your muscles
    and release any tension you feel. Notice if your
    breathing is deep or shallow. Deepen it each time
    so that you can almost FEEL the air "tickle your
    belly button." Relax each time you exhale.
  - *Visual-Motor Behaviour Rehearsal (VMBR)*: Relax
    as much as possible. Now, as clearly and vividly
    as possible, imagine yourself in an ideal
    performance.If you see yourself "in the distance,"
    add the feeling of actually experiencing yourself
    doing the activity. The difference is feeling alertly
    relaxed with a very slight sense of muscle activity/
    tension vs. feeling heavily relaxed.
    This technique can be used to:
    1. Rehearse an entire performance;
    2. Review and correct a specific performance
       problem so that doing it correctly becomes
       second nature;

        3. Practice approaching the crowd or competition with confidence.

- *Four or five hours before the event*:
    – List your objective, *e.g.* you want to emphasise a fast start, confidence, aggressiveness, a particular strategic approach to the other competitors;
    – Determine how to achieve the objective, *e.g.* plan to take a moment to visualise a fast start to the gun immediately before getting into the blocks.
- *Immediately prior to the event (before stepping to the line, blocks, or into the ring)*:
    – For a second or so, visualise your complete event as you would actually perform; see it happen, make this vivid visualising include the way the body is to feel as it performs;
    – Use an inner frame of reference—you are doing it IN the scene, not watching yourself do it;
    – Clear your mind after you have programmed your body by visualisation.

Chapter 10

Tactical Preparation and Technique Training in Sports

INTRODUCTION TO THE CONCEPT OF TECHNIQUE

Technique is a concept with varied applications and a great diversity of contents.

In contrast with other human technical activities, in sport activities all human capacities are involved and evaluated immediately. For this reason, there is a need for a more specific approach to the concept of technique.

Technique as the most rational and effective form to perform exercises. The ideal model of a movement relative to a specific sport activity. For team sports; Mechling (1983) defines technique as that movements or part of movements that permit to perform attack and defence actions with a concrete game purpose, and with a quite good execution quality (good with reference to an ideal model). It follows from these definitions that the sportsman, in order to obtain performance in his particular sport, must have learned a group of movements, following ideal models, result of different research, which will facilitate to execute precise actions to improve his motor skills.

Therefore, when a person possess this or that movement within his motor repertory, it is said that he has this or that ability; that is why, the group of movements of different sport specialties

are called sport technical abilities. Consequently, an sportsman will possess a good technical ability the best he adjust his movement to the ideal model, in addition to the best he can control it to obtain maximal performance during real competition. The aptitude of a person to acquire these abilities is understood as capacity.

Thus, an individual with a better learning capacity, will have the possibility to have a major number of technical abilities to apply to sport executions. We should point out, in passing, that to apply correctly a technical ability during competition not only depends of this capacity, but also on tactical capacities which are not the motive of this article. But, how this ideal technical model is established? It is the product of research that proposes a concrete movement to be performed as the most effective. However, the ideal model changes, and the ideal now is not that ideal after a period of time, when science and experience of coaches improve.

Therefore, we think that does not exist an ideal model, but the ideal model for each sportsman, which will depend upon his ability to perform during real competitive situations with reference to his possibilities to solve efficiently the situations proposed in that moment.

We neither agree with the term style as the personal interpretation that a person does of a determined ideal technical model, because his execution is a personal model acquired through practice and which is the ideal for him in that moment. Who can say that the ideal technical model of a person 15 years old must be the same than his ideal technical model when hi be 25 years old, when changes as corporal dimensions, weight, strength, concept of movement, contents, tactics, have occurred. The ideal model is transitory, thus the most important is to create a personal model that be adjusted to the game rules and facilitates maximal performance during competition at each stage of the sport life.

ANALYSIS OF THE TECHNICAL ABILITY

The need to examine the conditions in which the technique is executed. Each one proposes different options that are the base for the development of a particular analysis.

All technical abilities are performed by precise segmentary and/or global movements. Such precision makes the segmentary body parts to perform meticulous paths on the space. Also, that spatial trajectory must spend a certain period of time. All spatial and temporal aspects of a technical skill are easily observable and can be studied from different perspectives. They can be differenced from other called internal or structural aspects which will generate that external values manifested during sport practices of the athlete.
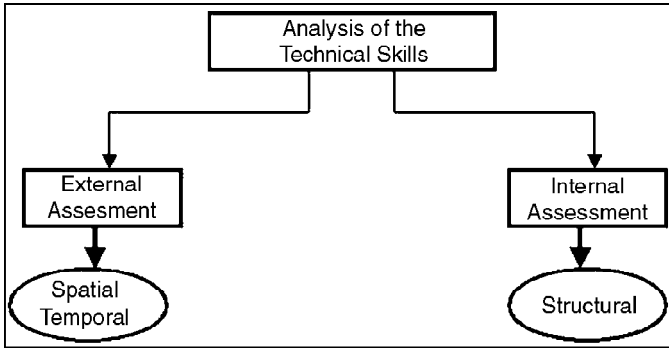
External factors are evident during the execution of each movement and they can even be observable by a non-specialist, while structural factors are of more complex assessment.
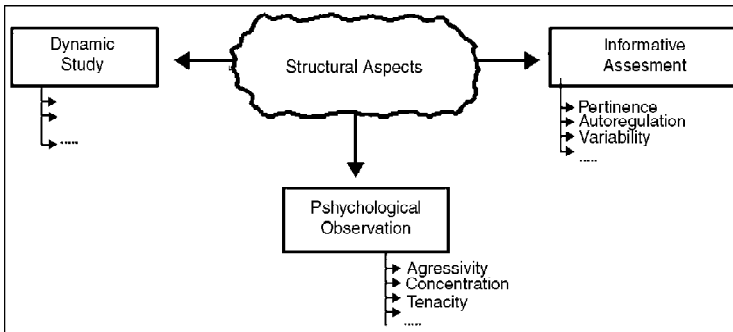

Fig. Description of the Spatial-Temporal Aspects

The number of factors proposed for each analysis is obviously open for including new elements, depending on the knowledge of the specialist.

- Cinematic studies allow to know both segmentary and global speeds, accelerations, etc. External biomechanics

is the science that develops these studies, which are often used for the description of technical skills.

- The medical-kinesiological observation is focused on the determination of technical conditions to prevent from deterioration of the human locomotor skeleton. A technical defect or a postural or muscular tone control defect, based on a kinesiological-postural criterion, might be very prejudicial for a future sport life.
- Technical skills may be externally assessed by a temporal criterion. Several qualitative factors (continuity, adequateness, anticipation, etc) are relevant for an effective execution of a technical movement.
- Many aesthetic factors of a technical skill could be assessed; as many as personal criteria of the aesthetic value of movement or things of nature (amplitude, symmetry, beauty, plasticity, expressiveness of skill, etc). We should not forget that the word technique comes from the Greek "tekhè" which most approximate meaning is "art". Unfortunately this value is marginalized by several coaches, except in those sport disciplines in which this concept is evaluated as part of performance.

In subsequent parts we will see how each of these factors is generated by one or several internal factors, from which they are their external manifestation. The best way of summing up this initial study is to state that all these spatial-temporal aspects (constituents of the external form of movement) are consequence of a correct coordination, and are the representation of an intention that generates movement.
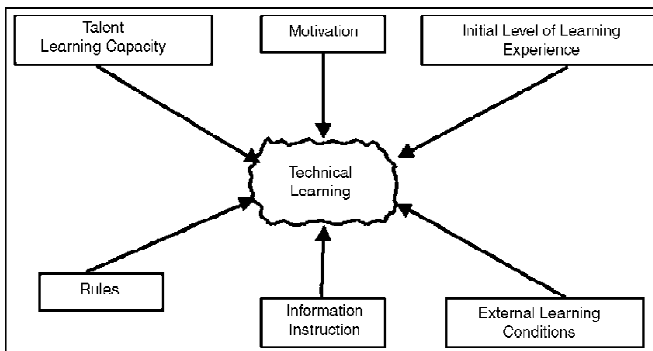

Fig. Description of the Structural Aspects.

Fundaments of the structuralism theory (Saussure, Köhler, Wertheimer, Kofka...) assert that exists a close interaction among all internal factors influencing the execution of technical abilities. For instance, concentration allows to choose adequately the type of movement and the possibility of being executed under a determined strength condition (qualities from different categories). The interrelation is so that a single factor modify all others; and external aspects are the manifestation of all of them together.

- The dynamic study of a technique allows to know the muscular work conditions (forces, momentums...) that bring about the observed movement. The "internal" biomechanics conducts these analyses and can explain many errors of the technical skills or their efficacy.
- There also exist the informative assessment of the conditions in which a specific sport technique is performed. For instance, pertinence to select a technique which is more or less compatible with the external conditions, progressive self-regulation capacity to adjust movements to competition needs, or the variability of a technical model in order to adequate it to an opponent.
- Psychological observations of a technical skill offer us a knowledge of the psychological factors added to that technique. Concentration, agressivity, persistence... are some features which can be observed during the execution of a technical skill and they produce typical personalities for each competitive situation.

As we mentioned, spatial-temporal aspects (external) are consequence of structural aspects (internal). It is evident that cinematic conditions are the result of force production (internal dynamic study).

Temporal assessment depends a great deal on informative factors. Thus, aesthetic and medical-kinesiological factors depend in part on psychological contents of movement, but also on dynamic components. It seems clear that both external and internal assessments are necessary for the understanding of performance of a technical skill. Therefore, we can explain how various subjects who execute "the same" technical ability obtain very different values in some of these internal and external components and

consequently perform, from a technical point of view, at a different level. For example, physical conditioning preparation, which is responsible of force application conditions (internal factor), can determine the outcome of a confrontation between two players of similar technical levels. Similarly, an appropriate tactical decision (that affects both internal and external factors) can be relevant in many cases.

All described factors will have differential influence in each sport specialty. By analysing the technical abilities of a particular sport in the way it has been proposed, we will be able to define in a more precise way the technical training goals for this sport specialty and, in addition, to propose a more individualized technical learning.

TACTICAL TRAINING

Tactical training is defined as any sort of training that is designed around a real-world task. That's our loose and very simplified description of it. Tactical training is the sort of training required by people working in real-life situations where there is a risk of serious injury or death.

This focus of training is vastly different, both physically and psychologically, than training for health or athletic performance. When you train for a sport or for health reasons you can predict the expected demands and plan for them. With real-world work such as law enforcement, military or fire service, there are many more variables and surprising accompanied by increased risk factors. So often we see police and military training programmes that focus on run of the mill fitness and controlled combat training. The technical aspect of the officer's skills is generally fairly fine-tuned, however when it comes to the crunch and they need to call on their conditioning in the field they are rarely prepared.

Everything we do at Personal Evolution is centred around tactical fitness and psychology. By focussing on the tactical you are better able to deal with situations that invoke unexpected stimuli and emotional responses. This applies primarily to the tasks mentioned such as law enforcement and military, however training this way for all purposes tends to develop a powerful threshold for surprise and adverse situations.

HOPLOLOGY

Hoplology is loosely defined as the "study of the development of human combative behaviour and performance". In other words, it's the study of why we fight, how we fight and the relationships between cultures in regard to combat and conflict.

Increasingly hoplology input has led to a vastly different tactical approach to training individuals and teams involved in regular combat or the likelihood of experiencing such a thing. This has influenced both the physical fitness components and the mental/psychological ones.

Specificity Through Not Specifying

Fitness training experts and sports scientists are often of the belief that training has to be extremely specific. This is true if the individual has highly specific needs with very little chance of variation. For everyone else, especially those getting fit for dangerous situations, a tactical training approach is required. This sort of specificity, as it applies to tactical training, is detrimental to performance. If a soldier or police officer is super-fit in one area of performance such as middle distance running in a controlled environment such as a running track, they hold very limited skills that apply to the real-world, life-threatening situations they are likely to encounter in the field.

The first aspect of tactical training is broad and inclusive. This means that all aspects and extremes of physical and psychological conditioning must be trained and developed to the maximum potential possible while coexisting. This, at first glance, may seem a little haphazard and rather easy to programme. This is a misconception, the training is still highly structured. The structure of this mode of training is designed so that there are no weak links, no peaking and troughing and continuous readiness through all parameters.

Contextual Training Needs

The problem I see with most training approaches, except athletic, is the lack of contextual preparation. In the real world there are many variables and things need to be prepared for from just about every angle imaginable. Go to any martial arts class

and you will generally see a bunch of people in a cosy environment practicing technical aspects of fighting. This gives the practitioner a false sense of security and fools them into believing they are prepared to actually use this stuff should the need arise. The same is true for any sort of training. When something is applied in a high-stress environment the dynamics are different, issues come up such as adrenaline, constant surprise, lack of rules, no opportunity for warm-up etc. This needs to be prepared for and incorporated into the conditioning programme.

A soldier is rarely afforded the luxury of predictable terrain, rules and predictable outcomes. The soldier must be prepared for high-stress situations, exhaustion and being taken by surprise while still maintaining mental faculties and the ability to respond rapidly with appropriate tactics.

With this in mind the conditioning programmes, both mental and physical, need to be structured so as to be undertaken in the most real way possible. So how do we do this?…

First of all training plans must not be revealed to the trainees prior to a given training session. This provides an element of surprise and does not allow the participant to prepare for the session adequately, just as would occur in a real-life situation. This is not always possible for a person preparing themselves with tactical training. So training sessions must be prepared in a highly varied manner. For the individual creating their own training sessions, I would suggest overestimating their own abilities and then rising to the challenge and meeting it.

Secondly there is always an element of technical skill involved in order to carry out a task properly. A technical skill learned in a controlled environment is only applicable to similar controlled environments. In order to learn a technical skill that is needed in real-world situations the trainee needs to be conditioned in the anticipated states that are likely to occur. With this in mind there needs to be a level of stress and exhaustion added to the technical application of skills. To give you an example, when I trained in Hapkido our black belt gradings were always something to be feared. We would be required to perform physical tasks that would result in complete exhaustion and then we were attacked in numerous ways and required to apply whatever we had at our

disposal in an effective and efficient manner. Next, the environment and actual methodology used in the training needs to more closely resemble that which is expected in the real-world environment. In other words, the ability to perform a lot of push-ups is not always helpful, this only serves as a base to build from. Performing a lot of push-ups only results in an increased ability to perform a lot of push-ups. The training needs to be more real world focused. What's more specific then? Maybe you need to crawl long distances on your stomach with significant added weight on your body.

Then you should practice that. You might need to climb high walls with added weight and do so quickly and efficiently. Pull-ups would help build some base strength, however they would not be a final conditioning exercise. It would be more specific to do muscle-ups on a wall or simply climb high walls repeatedly. Only by direct simulation of the actual expected stimulus can you be sure you possess the ability to perform the required tasks efficiently.

Lastly, and similar to the second point, required fitness aspects must be conditioned throughout a range of exhaustion levels. If you are required to possess the ability to lift large stones or jump over obstacles, you must be able to do it whilst fresh and still be able to do it after some time of physical exertion. For this reason you need to identify the stimuli needed and train under these circumstances. For example, if you need power and agility then you need to train for specific power and agility at various points in your conditioning session and condition these aspects even while extremely exhausted and after much endurance effort.

Psychological Threshold Involvement In Tactical Training

Tactical training requires a level of psychological involvement that is simply not applied in ordinary training approaches. I have trained many people in gyms and my experience is that most people, when faced with a significant physical challenge tend to give up, make excuses or simply break down. The same is true when they are faced with exercises or tasks they find difficult such as anything requiring stability. This is why many people prefer to

use machines when comes to fitness training, because they're easier to control and require less psychological input.

When someone is pushed beyond their usual level of comfort, they tend to find it difficult to go any further. Extreme physical conditioning, when endured, leaves a psychological imprint that stays with a person for some time. I have met people with relatively low fitness levels that perform better on fitness tests than others of higher physical condition. The reason is that the person with the lower fitness level has a higher psychological threshold, either innate or learned at an earlier stage of life or through some other modality.

Knowledge from pushing beyond comfort zones becomes instinctive rather than intellectual. This is useful knowledge and can only be gained from extreme effort. Automatic/instinctive action is always more efficient than well-thought out plans and intellectual thoughts. There is already plenty going through a person's mind at any given moment. As human beings we only have a certain amount of available energy and attention for focus. Once this is taken up that's it, we can't just make more. It's like RAM on your computer.

In confrontational and high-stress situations any action that occurs on autopilot and occurs much more rapidly as a result spares the available attention for important mental processing and decision-making. An effective tactical training approach is to train yourself to a point where common actions are executed automatically via trained instinct.

The type of training I engage in and use with my clients is tactical training and involves extreme effort whilst being required to perform technical actions or simply use of the psychological will to continue beyond one's own supposed limitations.

Extreme Physical Conditioning Applied to Tactical Training

As Gym Jones puts it, "The goal of physical conditioning is to become as indestructible as possible". The harder a man is to kill, the more effective and efficient he will be for longer. This may sound rather extreme, however tactically a person needs to be conditioned to the point of maximum resilience. This means

being more difficult to stop and possessing the ability to withstand and excel under extreme variations of conditions.

In order to possess this ability you need to train for it. The kind of fitness you see in gyms and conducted by personal trainers will not do. I see fire fighters going for long jogs and doing bodybuilding type programmes in gyms. This is simply not specific and will not prepare them for the extreme conditions they are likely to endure whilst doing their job.

Depending on the tactical training needs, I prefer to take a realistic approach. Quite often this causes fear and hesitation, however it is necessary. A fire fighter may need to carry heavy gear up and down flights of stairs, they need to climb ladders, carry the dead weight of human beings etc. This means they are required to possess adequate levels of strength possibly after hours of enduring gruelling physical labour.

There are no rests between sets when they are in the field. The same applies to other professionals responding to emergency situations. Police may be required to chase down a suspect then fight after a lengthy pursuit. A soldier may be required to march or even run up a rough hillside carrying all their gear for several hours then apply technical skills and fine motor control.

This sort of physical conditioning is far different to a controlled gym programme and requires tactical training approaches that cater to the "real" demands anticipated. There are several approaches that cater to these needs.

Peripheral Adaptive Endurance Training

Peripheral Adaptive Endurance (PAE) was developed initially as a tactical training modality, however it also applies to athletic conditioning and general fitness training. We have discussed PAE previously on this site, so we won't go too far into explaining the science behind it. What we will do is provide a basic run-down of this tactical training modality and then look at how it applies.

PAE can be explained as a broad conditioning approach applying varied modalities of fitness throughout a continuous, enduring duration. This means that PAE sessions are generally continuous and require the effective application of modalities such as strength, speed, power, coordination and balance under

circumstances where the body may not be at optimal levels of performance.

PAE often requires continuous application of various exercises until almost complete exhaustion whilst maintaining things like strength. In a gym situation it is easy to be strong when you get a rest between maximal efforts. However, in the field and in emergency situations it's not so easy.

You need to possess the ability to be efficient even with high intensity demands when the body is already taxed, depleted and exhausted. It's like competing in a triathlon then being asked to perform flawless Olympic weight lifting at the finish line. Regular training would simply not prepare a person for this sort of demand.

Peripheral Adaptive Endurance is not just extreme effort over long periods of time though. There is a certain structure to the sessions. PAE uses varied movement patterns over the course of a session, moving from one to the next as opposed to continuous effort such as in a marathon. It is continuous effort, however the nature of that effort varies.

The easiest example is using alternating patterns of upper body and lower body effort. This also caters to another aspect, output. By varying the movement pattern you are sparing one group of muscles while others are working maximally. This allows for a continuity that would be impossible otherwise. The intensity level is always as high as humanly possible. This results in extreme output that never ceases until the end of the session.

PAE is a simulation of expected demands. It is not 100 per cent specific, however this is a general, broad and inclusive fitness modality used as a base to launch other, more specific tactical training.

Without being used to the extreme output, there is little hope of efficient application of more highly specific training demands. By conditioning the body in this way you are able to cope with high levels of exhaustion and still apply technical skill and strength/power aspects. In the field levels of intensity and effort cannot drop off as the body and mind gets tired.

Another major aspect of Peripheral Adaptive Endurance is the psychological imprint it creates. Generally a person has a threshold that is psychological in nature. This threshold pertains

to the will to continue into extreme conditions. The natural reaction is for your mind to tell your body to stop as a protective mechanism. PAE is high intensity over a prolonged period. Gradually the brain begins to increase the psychological threshold for effort so that a person can mentally go beyond that of an average person.

TECHNICAL PREPARATION

The aim of technical preparation is to create and improve sports skills. Each sports skill has a given way of solving a motor task (contents of a sports skill) in accordance with the rules of a given sport, biomechanical rules and locomotive possibilities of the athlete which are referred to as technique. Specific individual adjustment of technique by an athlete is referred to as style.

Procedure of acquiring motor skills:
1. Sports skills are created on the basis of information on external and internal environment of the athlete and their synthesis into a complex image about the situation (skill) to be solved.
2. Creating such image is carried out on the basis of information acquired from senses (visual, audio, locomototive and positional) – perception.
3. By repeating, perceived situations are gradually being fixed into corresponding perception patterns.
4. Through afferent pathways, files with such information are transfered to CNS where they are further analysed in programming processes.
5. It is here that the neural basis of relevant programme is formed.
6. The programme is stored in the relevant memory.
7. Selected solution programme is implemented by relevant structures of neural impulses which evoke relevant activities within skeletal muscles.
8. Gradually, structures of conditioned reflexes (movement stereotypes) in the form of motor patters are created.
9. By repetition, these patterns are being formed into independent neuro-physiological units (perception patters, programmes of motor solutions).

10. To a certain extent, they are independent and can be combined into new units.

Stages of Technical Preparation

The process of learning motor skills is based on theoretical findings on motor learning.

Accomplishing the aim is conditioned by:
- Understanding the technique as a unity of its internal and external features
- Step-by-step procedure of its acquiring
- Stabilizing the technique
- Comprehensive conception (contents organisation)
- Conscious activity of both the athlete and coach

The process of learning is not linear and even; it is a long-term process unlimited by time.

In practice, the following stages appear:
- Drill
- Improving
- Stabilisation

Drill

Tasks:
- Learning the objectives of selected sports discipline
- Drilling the techical basics of relevant sports skills

This stage proceeds in the follow axis:
- Introduction (rules, feeling the water, ball etc.)
- Defining the task (couch's input, athlete must identify him/herself with the image)
- Creating image
- Initial attempts (verifying the image under simplified conditions), repeating ("repeating without repetitions")

Improving

Tasks:
- Firming, improving and subsequent adjusting techniques in given specialisation
- Gradual interconnection of technique and fitness requirements and physiological functions of the athlete

- Focussing the stage aims at further shaping the image

All information is integrated in a single unit of complex locomotive analyser which is sport specific. Firming and improving is carried out through sophisticated repetitions of relevant exercises which lead towards automation. This stage continues to improve mainly kinematic (time and space) and dymanic (strength) parameters of motion structures. Techique should be gradually interconnected with its fitness basis and energy supply. The main aim of this stage of technical preparation is final technique firming and stabilisation.

Stabilisation

Tasks:
- Firming and stabilisation of sports skills complexes as units which are ready to be involved in programmes for competitve activities of the athlete
- Mutual interconnection, combination and adjustments of these units to most demanding conditions under which sports activity is employed
- Attempts to firm and stabilize lead to another, more in-depth, uniting of technique, fitness, psyche and tactics into highly functional units

The substance of stabilizing technique in this stage lies in automation of relevant structures and actions of skills structures and their continuous adjusting to competition conditions.

TACTICS AND TACTICAL PREPARATION IN ARCHERY

In going in for sports, which have preparation for participation in the sports competition as the nearest goal on the level of sports exercises technique, teaching sports tactics takes place. Archery is not an exception. A word of tactics came into sport from the military terminology (from the Greek word of taktika - art of constructing troops), component of military art, including theory and practice of preparation and conducting the fight. There are several popular definitions of the notion - SPORTS TACTICS. Sports tactics is an art of competing with an «opponent». Its main task is the most expedient use of forces and possibilities for victory.

The basic tool of tactics is the sports technique, applied in the permanent and changing conditions of external environment, according to the plan and tasks, which arise. Sports tactics is purposeful methods of the use of technical principles in tactical actions in order to solve the tasks of the competition taking into account the rules, positive and negative descriptions of the preparation, as well as environmental conditions. Tactics in sport is an expedient and conscious change of conduct, actions of a sportsman or of a team depending on conditions and situation that is developing (or which can be foreseen) in order to achieve success in the sports competition.

Now technical, physical and psychological preparation of archers is on high enough, approximately identical level. Therefore other conditions being equal the level of tactical art of archers very often determines the victory at the biggest international competitions.

Level of tactical readiness depends on mastering tools of sports tactics by an archer (*i.e.* technical and tactical actions), as well as mastering its forms (individual, team). Structure of tactical readiness follows from the character of strategic tasks, which form the basic directions of sports contest. These tasks can be linked with the participation of an archer in the series of competitions and with the goal of his/her preparation for the main competition of season and, thus, be of a perspective nature. They can be local as well, *i.e.* related to participation in a separate competition, to shooting on a separate distance, or in a separate one sparring meeting.

The basis of tactical readiness of separate sportsmen and teams is the mastering of modern tools, forms and kinds of tactics by them; accordance of the tactics to the level of development of archery; accordance of the tactical plan to the peculiarities of the competition (condition of the place of the competition, peculiarities of regulation of the competition, weather conditions, readiness of participants for the competition; way of judging; fans' behaviour, etc.); binding of the other sides of readiness, such as technical, psychical, and physical, with the level of perfection as well as with the quality and level of financial side. While developing tactical plan tactical actions experience of the best sportsmen, main

competitors, their technique and physical abilities, psychical readiness; technique, tactical and functional abilities of partners, variations of tactics in different conditions, depending on the character of technique and tactical actions of competitors and partners, run of the competition should be taken into account.

Peculiarity of the archery is a deciding factor, which determines the structure of tactical readiness of an archer. For example, one of the basic components of tactical readiness in archery is the choice of a reasonable tactical plan and its use in the competition. Peculiarity of tactical preparation in archery is also the fact that an archer uses complex technical equipment such as bows, arrows, plungers, sights, stabilizers, etc in his sports activity.

Knowledge of principles of action of equipment, which is used, its advantages and disadvantages considerably enrich an arsenal of tactical abilities of an archer. Tactical actions of an archer at competitions are directed on the achievement of optimum success.

They should be built according to the quality of equipment, which he/she uses, to the tactical knowledge, to the level of his/her technical, physical and psychical readiness, to the level of development of physical abilities, volitional qualities, speed of reactions and other components. Concrete tasks, which are set by a sportsman for himself/herself in the competition, also refer to the questions of tactics. And it is a very important part of tactical preparation as it affects eventual result substantially. Range of possible tasks is very large.

Choice of the tasks, which are set by a sportsman independently or which are recommended by the coach, should be made very attentively and with great responsibility. Tasks can be applied both to the participation in the competition on the whole and to its definite stages. Let us try to examine some of the possible variants of this kind of tasks:

- To show the highest possible result
- To show the set result
- To win, indifferently with what result
- To show a result or take a place, which will give a right to continue the competition (in 1/32, 1/16 finale, etc.)

- To show a record result on a definite distance or in an exercise
- To improve one's effectiveness gradually as the competition proceeds
- To take a definite place, for example, to take the first place or to be one of the best three, six, thirty two and etc participants
- To overcome a definite competitor
- To test new equipment (bow, arrows, stabilizers, etc)
- At participation in the competition to try to pay above all attention to the quality of one's technical actions, and not to the hit of the target or to the result
- During participation in the competition not to make some (concrete) technical mistake
- At shooting at the definite distances a task is set for the archer for the predominant hit of arrows in the definite circle of the target or in other words, to "agree" to optimum and real hits at the moment. For example, while shooting for 90 meters a task is set not to go out of the size "7", at 70 and 50 meters not to go out outside the size "8", and at 30 meters to "agree" to the hit in the size "9"
- To focus main attention on participation in the "Team Olympic round", but not on the individual shooting
- To check the quality of adjustment of his/her own bow and arrows
- To try to adhere to the optimum rhythm of shooting, or shoot quicker than usual etc.

Tactics of an archer in the great deal depends on the tasks, which follow the regulation and the rules of the competition. For example, the introduction of new rules of conducting the competitions in archery changed the requirements to the tactical preparation of an archer a lot. That is why not all are called to this; favourites of archery were able to adjust to new tactical tasks and were even forced to halt active training in archery.

While solving tactical tasks great amount of possible conditions, on which their implementation depends, should be taken into account.

As an example we can consider the case of necessity of participation of an archer in the competition on condition of deterioration of his/her special endurance (conditionally, because of illness or protracted business trip, he/she had an unforeseen large recess in the regular trainings on the eve of the competition). When constructing tactical charts and actions such archer should better give up participation in the competition because of the threat of causing harm to his/her motive habits.

But if because of definite circumstances there is no such possibility, this archer can be recommended to use an easier bow, to facilitate force of limbs of the bow or aim him/her at shooting at a more rapid rate with the purpose of economy of forces and energy used for treatment of separate shots, etc.

Tactical skills of an archer are interlinked with his/her psychological preparation. There are cases, when it is very difficultly to conduct a border between the tactical actions of an archer and his/her actions, relating to his/her psychological preparation, to be more concrete to his/her own psycho adjusting. In the psychological aspect tactical actions are the product of difficult psycho motoring processes, which flow consistently and conjointly. Psycho motoring processes of a tactical action take place in three main phases:

- Assistance and analysis of competition situation;
- Mental decision of the special tactical task;
- The impellent decision of a tactical task.

These three phases create a successive decision rank of tactical tasks and are in the close interaction. Moreover, archer's memory plays here a deciding role. Tactical actions in the cybernetic plan are a searching system, directed at the target, which among the possible targets not only elects the most favourable one, but its decision will be also improved in the course of action.

In the course of growth of effectiveness in sport as well as in archery, number of questions, which relate to the tactical preparation of archers, is constantly multiplied. To the modern questions of tactics it is possible to refer not only actions of an archer executed by him/her directly at competitions, but also those executed after their limits. So, for example, rituals of assembling and preparation to the future competition, feed on the eve of the

competition, equipment of an archer, sequence of choice of options for the training, etc has a direct attitude towards tactical preparation of archers.

Activity of tactical actions is an important index of sports skills. A sportsman of high qualification should be able to impose his/her will to the competitor, to make permanent psychical pressure at him/her by the variety and efficiency of his/her actions, self-control, will for victory, faith in success. Efficiency of tactical activity in archery is determined by the capability of an archer to anticipate spatially and temporally that is to guess ways of the development of the situation at the competition. The exact choice of an archer of the aiming point in difficult weather conditions depends in a great deal on this ability.

METHODS OF TACTICAL PREPARATION

Tactical preparation is a process, directed on study of essence and basic theoretical-methodological principles of sports tactics; mastering of the basic elements, methods, variants of tactical actions; improvement of tactical way of thinking; study of the information, necessary for the practical realisation of tactical readiness; practical realisation of tactical readiness. Improvement of tactical archers' skills is as a rule carried out in the process of tactical training.

Definition: Tactical Training is a type of training, which has the knowledge and the selective application, by the sportsman or team, of the most proper technical proceedings in order to solve certain partial or final tasks of the contest for an object. But in reality, the tactical skills of an archer is improved practically constantly, both during other types of training, and at the time spare from the basic types of training.

This peculiarity is explained by the fact that in the tactical preparation of an archer both accomplished domain by the tactical methods and develop an archer's habit of tactically correct thinking are important in the equal measure. Definition: Tactical thinking in sports is a sportsman's ability to estimate quickly and correctly the conditions of a sports struggle, which change constantly, and according to this to realize his/her own tactical plans or make changes in them effectively in connection with the circumstances.

Among the basic directions of tactical preparation in archery we should mark out the following: study of essence and basic theoretical methodical principles of sports tactics; collection and analysis of the information, necessary for the practical realisation of tactical readiness; master the basic elements, principles, variants of tactical actions; improvement of tactical way of thinking; practical realisation of tactical readiness.

The study of essence and basic theoretical methodical principles of sports tactics consists in the theoretical mastering of general principles of sports tactics, tactics of archery, rules of judging and principles that concern the concrete competitions, peculiarities of tactics in family types of sport, tactical experience of the best sportsmen, methods of development of the tactical conception, etc.

A study of essence of tactics is a necessary pre-condition for mastering tactical actions, development of tactical abilities and skills, forming of tactical way of thinking. The knowledge of theoretical methodical principles of sports tactics helps to estimate a competition situation precisely, to pick up means and methods of competition activity adequately taking into account the individual features, qualification, level of readiness of a competitor and partners.

An archer acquires the tactical knowledge during his/her whole sports life (career), multiplying it volume according to the growth of his/her skills and accumulation of experience. The objectivity and expedience of his/her tactical conceptions, plans and projects in great deal depends on the plenitude of this knowledge.

The whole complex of verbal and visual methods helps an archer to gain the knowledge of the theory of tactics. Special literature, lectures, conversations, explanations, viewing competitions, films and videotape recordings, their analysis, etc are the sources of this kind of knowledge. However, it should be remembered that this knowledge alone not supported by the personal motive experience of an archer can not affect sports results positively. For the practical mastering of the concrete principles of tactical skills of an archer we can recommend to conduct special lessons (trainings).

The main aim of this kind of lessons should be gaining of concrete tactical knowledge, principles or skills. These can be special lessons dealing with improvement of team rounds shooting, lessons imitating shooting in the conditions of time «trouble» - (shooting of definite quantity of arrows in the limited period of time, for example, high-quality release of three arrows for 30 seconds), special lessons for verification and improvement of «sense of time», etc. As an example it is suggested to conduct lessons putting an accent on acquisition of knowledge and abilities in the sphere of tactical preparation: As it is generally known, there is a wide difference in the «cost of amendments of breech-sight» on different distances which depends on the individual features of archers, on the large variety of technical descriptions of materiel, which they use. For the armament of archers with the practical knowledge about the «cost of amendments of their own bows» it is possible from time to time to suggest executing similarity of laboratory works at the training.

For example, at 30 meters distance it is suggested to the archers to execute a few series with the combination of center of grouped of arrows with the center of target. After this it is recommended to make alterations in breech-sight on the concrete size (for example: to displace foresight for 5 mm to the right and also for 5 mm downwards).

Then the archers are recommended to execute a series of shots and to define the center of new grouped exactly. Simple arithmetic division of distances on horizon and on the vertical line from the center of the target to a new center of grouped for the quantity of the amendments (in this case 5) borne in breech-sight will be a cost of amendment in 1 mm at 30 meters distance. On all remaining distances 'costs of amendments' are determined similarly. It is possible to pay attention to the small distinction in the cost of 'amendments' in sight of the horizontal and vertical planes. This distinction can be explained by the fact that there is a small distinction in their characters.

When we make amendments in the vertical plane, length of the aiming line forms distance from eye to foresight, and when we make amendments in the horizontal plane we take the distance from bowstring to foresight into account. But because of

comparatively small difference in these distances, it is possible to ignore such sizes.

Collection and analysis of the information which is necessary for the practical realisation of tactical readiness. Foremost, this concerns information about the economic feasibilities and features of materiel part that is used, possible competitors and partners in the team, environment and terms of conducting of future competitions.

The most essential information about competitors is the information about their physical readiness, their technical tactical manner to conduct competition fight, peculiarities of their conduct in different (favourable and unfavourable) conditions of competitions, characteristics of personality, volitional and psychical qualities. Collection of information about environment and terms of future competitions are necessary for the design of such training terms, which would be adequate terms of future competitions, so that sportsmen would gradually adopt themselves to the specific conditions of competitions and prepare their equipment, clothes and shoes to the concrete terms of the competitions.

Here it is necessary to take into account terms, place and time of conducting of competitions, climatic conditions (temperature, humidity of air), quantitative and qualitative entry list of the competitors, members and qualification of judges, state of the sports buildings (quality of shields for catching of arrows must be of the special interest), etc.

Improvement of tactical way of thinking. In the process of preparation to competitions it is impossible to foresee all possible situations of future competition fight. Therefore one of the basic tasks of tactical preparation of a sportsman is to improve his/her tactical way of thinking. Thus it is necessary to develop the following abilities:- to perceive quickly, to realize and analyse competition situations adequately;- to estimate a situation quickly and precisely and to make decisions according to the circumstances and level of one's own readiness;- to foresee actions of a competitor (team partner); - reflection to display one's actions according to the goal of competitions and tasks of a concrete competition situation.

It is important for an archer to develop his/her spatial and temporary foreseeing of situations before they are going to happen. Together with the growth of sports qualification an archer acquire capacity of the exact temporal and spatial extrapolation of technical-tactical actions. Speaking about tactics we should also put an accent on the ability of a sportsman to operate mental material, which consists of knowledge, verbal instructions (of the coach), picture of motions, competition situations.

The tactical thought is developed by exercises, which consist of observation and search for the tactical essence when weather conditions change during the competitions, at the change of one's own state (appearance of fatigue, discovering of one's own technical errors), breakages and damages of equipment, gestures, motions, actions, intentions, and states of competitors. Concentration of attention and consciousness of an archer on the search of effective methods of fight for victory helps to improve tactical thought. Tasks related with the improvement of tactical thought should induce to the analysis of possible aspects of competition situations in the fight for victory. A sportsman must remember about the results of actions in similar situations (his/her own and other sportsmen's), to make decision in the limited spans of time.

Method of training with competitor and method of training with the supposed competitor are the basic specific methods of improvement of tactical thought. Exercises done on the special devices, training devices, individual lessons with the coach and tests are also used with this purpose. Among the methods of improvement of tactical skills participation in great number of the sports competitions, different in terms, entry list and scale is especially valuable.

Exactly in competitions valuable experience is gained, which helps to find a reasonable form of acting in the process of sports fight. Analysis of tactical activity in the conditions of training and competitions is also very important. Archers should tell the coach about things they succeeded to find out in competitions, what their actions were caused by, and what intentions they had, what prevented to fulfill the plan of conduct of the competitions. They must be able to consider and analyse their tactical actions on

training and competitions in details. At this time coach together with them analyses their senses, determines how quickly and correctly archers perceived the conditions of competitions and reacted on them, whether they were attentive and observant, what prevented them from executing the tasks, how physical and moral-volitional qualities were showed up in competitions, how technical skills were realized.

Mastering tactical actions. Tactical essence of actions is as a rule mastered practically together with the mastering technical principles (archer's technique). Exactly in the process of practical mastering of technical principles archers are conscious, that their technical actions must be connected with realisation of possible tactical variants.

The task of tactical essence and its possible efficiency means that an archer will be able to do the optimum choice of action and successfully solve a tactical task in the definite situations operatively. Mastering of essence of different tactical situations foresees the study of typical situations and peculiarities of behaviour in any of them, as well as preparation to the conduct of competition fight with different competitors, in different conditions.

In teaching tactics of archery it is possible to use all aggregate of verbal, visual and practical tools and methods of preparation. However, the most complete practical tools and methods are used here. The principle of modeling of a sportsman's activity in competitions is the basis of practical methods of tactical preparation. With this aim artificial conditions or situations that model specific activity of a sportsman are introduced into the training of an archer. For example, during implementation of a control or shooting "on the account" a coach can artificially model such situation when a bowstring is torn or a stabilizer breaks off, etc at the competition.

Practically, this can be realized in the request of the coach to change the bow-strings on spare and continue shooting if possible without the decline of its quality (imitation of breaking-off of the bow-string), or to remove stabilizers (imitation of breaking-off of stabilizers) and also continue the successful conduct of shooting, or continue shooting using the spare bows. Except for acquisition

of tactical skills this kind of exercises is also of purely psychological use. The point is that this kind of exercises diminishes a degree (level) of anxiety in real circumstances of competitions and archers at the subconscious level stop to be fearful of possible unexpected cases and are not already lost in the cases if similar unforeseen situations happen during competitions in reality.

Method of training with a competitor is used for the detailed working out of variants of tactical actions, tactical improvement taking into account the individual features of archers; improvement of volitional qualities; bringing up of the ability to use one's possibilities in different tactical situations which are created in the course of competitions.

The exercises with the conditioned situations, where a sportsman that acts as a competitor, operates within bounds of the tasks expressed definitely by the coach and models the fragments of separate competition situations are also used. On different stages of long-term preparation and in different periods of training macro cycle of tactical skills improvement is paid different attention to. The greatest attention is paid to the tactical preparation on the stage of maximal realisation of individual possibilities, when a sportsman gets ready to the highest achievements.

On the stage of the specialized basic preparation main key components of tactical skills will be improved. On the first and the second stages of long-term preparation the tactical improvement deals, mainly, with the theoretical and practical preparation. The biggest volume of tactical preparation in macro cycle is at the end of preparatory period and during the period of competitions. On the first stage of preparatory period separate components of tactics will improved. The work considerably increases on the stage of direct preparation to the basic competition. The level of technical skills, physical and psychical readiness, which was formed before this stage, gives a possibility to proceed to the improvement of tactics in its closest approaching to the terms of future competition activity.

The choice of this or another tactical variant, its improvement and its realisation in the competition activity depends on the level

of tactical skills of a sportsman, development of his/her motive qualities and possibilities of the major functional systems, moral-volitional and psychical readiness. In fact it is possible to consider process of tactical preparation as an original uniting factor in relation to other component parts of sporting skills. Practical realisation of tactical readiness. This is a synthesizing direction of tactical preparation, its purpose is to solve tactical tasks, such as creation of integral notion of the course of competitions; formation of individual style of conduct of competition fight; decisive and opportune embodiment of the accepted decisions through the rational principles and actions taking into account the peculiarities of weather conditions, of competitor's actions, of the environment, of judging, of the competition situation, etc.

The integral notion of tactics of competition activity is formed and varies during the sports activity. The most noticeable overvalues and changes in the sportsmen's notion take place after their participation in the main competitions, which more than any others test their sports skills, make them notice all "pros and cons" states of their readiness, compare new information with the notions that were acquired earlier.

It is Possible to Make A List of Minimum of Knowledge, Abilities and Skills, That an Archer Must Have in The Field of Tactical Preparation:

- To be able to estimate and to memorize size of the shift of the middle point of hitting (MPH) of the arrow on all distances of shooting on condition of moving pin of sight for 1 mm both in vertical, and in the horizontal plain.
- To be able to calculate the necessary amendments and bring them into sight.
- To know the size of shift of MPH of his/her own arrows at shooting on different distances at different speed directions of wind.
- To be able to shoot with the bearing-out of point of aiming in different areas of the target and beyond it.
- To be able to determine force and direction of wind by the external signs.
- To have optimum variants of warming up exercises and

to be able to make use of them before training and competitions.

- To know an optimum psychological microclimate for himself/herself and to be able to create it successfully at competitions.
- To have a clear picture of rational nourishment (taking into account the individual features of his/her organism) and strictly adhere to him in the period of participation in the competitions.
- To be able to use the pauses of rest between shots, between series and between distances during competitions rationally.
- To be able to have under the control the state of his/her equipment constantly.
- To have comfortable sports clothes at competitions for different weather conditions that have been fitted and tested preliminary in the conditions of shooting.
- To be able to adjust shooting correctly during ranging series and to provide the constant control above position of MPH. To react to displacement of MPH in time.
- To feel well the motion of time given for implementation of series of shots, to be able to use it. To not be afraid of time troubles. To be able to shoot quickly with high quality, after the protracted expectation of an opportunity, because of the gusts of wind being in pose of readiness to the shot as well.
- To be able to shoot in different temporal modes. At necessity to be able to shoot with high quality without the use of clicker, if that is required by circumstances that have turned up.
- To have affected variants of conduct and actions in cases of breakage or problems with clothes or equipment of an archer.
- To have the list of all the necessary things that must be in the case for a bow and arrows on inner side of it. To work out a habit to check up on this list presence of all necessary things before going for training and competitions.

At request it is possible to continue this list further, as in the tactical preparation of an archer there is practically no borders. There are cases when an archer makes a tactical decision successfully and in future no one ever repeats this. Important components of forming of integral notion about the tactical preparation are: - awareness of the sportsman of his/her own technique-tactical arming, features of individual manner, advantages and lacks of preparation; - understanding of intercommunication between the preparatory actions and basic ways of conduct of competition fight; - understanding of character of initiative and value of such tactical elements as suddenness, timeliness and etc.; - understanding of necessity of self-control and conscious risk, knowledge of variants of conduct in different moments of competitions, ability to conduct warming up exercises and regulate one's own mental condition independently; - mastering of power of counteract with competitors different in style of shooting and in force; - understanding of psycho- tactical specifics of competition fight; - clear picture of purpose of preparation, participation in the separate competitions and separate meetings, about the paths of attaining a set purpose and solving separate tasks. An ultimate goal of tactical preparation is the formation of a definite style of conduct of competition fight.

Style (manner) of conduct of tactical fight must include general principles of tactic of archery and take into account individual features of a sportsman, including his/her lacks. The practice of sport for a long time has marked out the odd cases of loss of strong sportsmen and strong teams to the weak enough competitors. This is the result not to so big extent of a bad mood, but to a bigger extent of inadequate reflection of a model of the competitor. Most frequently this happens, if an experienced sportsman underestimates possibilities of his/her opponent or over-estimates his/her own.

METHODS OF TECHNICAL PREPARATION

- Methods: analytic, analytic-synthetic, concentration, dispersion.
- Procedures: whole, from whole to part, from part to whole.

Tactical Preparation

It is necessary to differentiate between two terms:
- Strategy is understood as a pre-prepared plan of actions in a specific competition.
- The plan is defined by key strategy points (points in competition when the athlete makes decisions according to given strategy in so-called conflicting situations).
- Tactics further analyses and shows possible solutions of individual competition situations (conflicting situations).
- Focuses on practical implementation of these situations within given plan (strategy).
- Tactics (individual, group, team, offensive, defensive).

Implementing tactical actions is carried out on the following axis:
- Perception and analysis (situation occurence – situation recognition – situation analysis).
- Mental solution (solution proposal – soluction selection).
- Movement solution (solution execution, feedback).

Tactics is being solved within competition situations which are characterised by conditions.

We can differentiate between two types of conditions:
- Fixed (sports ground, sports area, equipment etc.)
- Changing (referee, audience, route, ball bounce etc.)

Drilling Tactical Skills

Tactical skills are understood as certain procedures or models of competition situations solutions acquired by training.

Acquiring tactical skills presupposes influencing the athlete's:
- Perception (space, rhythm, objects).
- Thinking and decision-making (analysis, synthesis, generalisation, intuitive solutions – solutions outside the scope of perception).
- Knowledge (rules, organisation of sports combat conduct, principles of tactical actions in specific situations, knowledge of strategy).
- Experience (memory, anticipation).

Principles of drilling tactical skills:
- Tactical skills are closely related to technique.

- There is a certain specific solution for each competition situation.
- Theoretical background (algorithms, patterns) must be acquired before drilling itself.
- Suggest solution to a situation when drilling and perhaps let athletes to discuss it.
- At first, teach without pushing, increase resistence and pressure (time, space, fatigue) after they handle individual parts.
- Group skills (power play patterns) must be practised in an analytic way (in pairs or groups of three).
- Tt is preferable to handle solving smaller number of situations with better quality.
- Adjusting situation to expected competition conditions.

Solving Competition Situations

When creating strategy plan, pay attention to the following:
- Competition Aim.
- Competitor Power.
- Competitor Strategy.
- Own Power.
- Information on environment and conditions.

Solving practical situations is based on the level of preparation during training and the extent of their indefiniteness (*i.e.* they cannot be prepared in advance)

We differentiate among:
- Algorithmisation (standard situations I.) the athlete chooses from several pre-peraded solutions (A, B, C options). Medium indefiniteness.
- Patterns (standard situations II.) everyone knows what to do in a given situation, both me and other team-mates (*e.g.* direct free kick, ofensive combination, service in volleyball. Minimum indefiniteness.
- Instant unprepared solution is improvised. Creativity is of very high importance. High indefiniteness.

Psychological Preparation

The aim of psychological preparation is to make use of psychological findings to increase efficiency of other sports

training components and, within competition, fix efficiency at the level equal to acquired training level. In other words, it attempts to minimize effects of negative mental influences and at the same time positively influences the athletes' psyche in order to reach high sports efficiency.

The approach of psychological preparation deals with:
- Model training
- Regulation of current mental states
- Regulation of interpersonal relationships
- Influencing the personality of an athlete

Model Training

The starting point of model training is theoretical knowledge of adaptation process from the point of view of psychology. Adaptation stimuli are represented by situational influences which negatively influence the athlete's activity with their psychogenic effects. What follows is that it is necessary to include competition situations "models" into training. Coach is required to be inventive, creative, like an actor or director, and able to convicingly influence his trainees who on the other hand must cooperate during model training by accepting the rules of the model. An example of model training can be repeated finish of set endings in volleyball under mental pressure when the score is unfavourable.

Regulation of Current Mental States

Current mental states can be divided into pre-start, competition and post-competition.

Pre-start states – they appear when the athlete realizes he/she participates in an important competition. These states gradually melt into in-competition states.

Post-competition states – the are evoked by subjective assessment of the course of competition and can last for several hours. The starting point for regulating such states are findings on activation level of athletes.

According to level of activation and its direction:
- Too high level of activation (start fever) – negative (aversive jitters), positive (eager jitters)
- Low level of activation (start apathy, indifference, apathy)

Post-competition states origin from success or failure. Failure causes depression, neurotic manifestations, resignation, hopelessness.

Means of regulations can be divided into for groups following their aim:

- Lowering activation
- Increasing activation
- Iowering negative experience of failure
- Removing psychological effects of fatigue

Particular means selection is a specific, to a certain extent individual matter.

Regulation of Interpersonal Relationships

In a sports team, there are two basic types of relationships among athletes: competition andcooperation. Both of these must be present in the team in an optimum degree.

If competition overwhelms cooperation, there is rivalry in the team which affects cooperation (the trouble of several individualities). High level of cooperation without competition usually leads to general benevolence which results in missing motivation.

TECHNIQUE TRAINING

Technique is what allows you to do a route as efficiently as possible, to use the least amount of strength/energy to get to the top. Different people have different body types, different strengths and different needs for technique. Technique is used all the time while climbing. There are different ways of generating momentum, taking the weight off of your hands, or even holding onto holds with less energy. The drills presented here are designed to teach you how to become a more efficient climber. One of the most important techniques to learn is how to use your strengths to your advantage.

FOOTWORK

Feet. These are those little things at the end of your legs that you walk on all day long. They are designed to support your weight so it is a good idea to learn how to use them when climbing. Not

only that but you spend hundreds of dollars a year buying shoes so you might as well justify the money by using the shoes.

There are many different types of footholds and all of them require knowing how to properly stand on them.

Some good footwork drills are:

Accurately Placing Feet

If you watch a good climber or someone who climbs a lot you will notice that they do not adjust their feet that much. They know where to place their feet and they know when their feet are right. A great drill for this is to concentrate on your feet while you are warming up. This means looking at your foot until it is on the foothold.

Indoors you do not need to edge that much, most feet are fairly large and the best way to place your feet is to actually touch the wall about 1cm above the hold and smear down onto it. This will set you up for rotating on the hold later. Before your foot is placed try to determine the sweet spot of the hold, the place where you thing you can stand and put the most weight on it. Experiment with different positions on different holds. Only when you are satisfied that you have the best foot placement do you make the next move.

This drill is great because it will teach you where your feet are. By doing it slowly in warmup you will reduce the amount of readjusting done on harder routes. Most people look up from their feet too soon, before their feet are properly on the hold. This means that they may miss the sweet spot of the hold.

Weighting Your Feet

Determining how much weight you can put on your feet will depend on the angle of the wall, the size of the foothold, and the angle that you are stepping from. This drill should be done on several different angles and can be done as part of a warm up or when you are already tired.

Start with both feet on what you consider bad footholds. Hold on with one hand. Now slowly try and relax your hand and concentrate on your feet, feel how much weight they can take. You should relax until your hand lets go. Make sure you do this

very slowly and on different types of footholds. This will show you how much you have to hold on with your hands and how much weight you can transfer to your feet, a very useful thing to know.

This drill should show you if you are overgripping too much when you climb. Overgripping is when you are squeezing too hard with your hands. Concentrate on relaxing your forearms and your arms. You may need to tighten up your core (abs, hamstrings, quads) in order to take as much weight as possible.

Pulling With Your Feet

Your legs are stronger than your arms, and can support your weight better. Learning how to pull with your legs rather than your arms will allow you to save that precious upper body pulling power for times when you really need it.

You can move your body with your legs by reaching out with your legs and pulling with your feet. This means that you will have to cup your toes slightly in order to pull from the other side of a hold.

Try this. On a vertical or slightly overhanging wall grab two holds and hang straight down. Keeping your arms straight put both feet on the wall, extend one leg out and place it on a hold. With your arms still straight pull your body towards the foot until your hips are almost directly above the foot. Try this in the other direction as well and on steeper wall. It helps to have softer shoes that allow you to toe in on foot holds for this drill.

Back Stepping

Back stepping is when you place you little toe, or outside edge against the wall when standing on a hold. It allows you to push your body in one direction or the other while keeping your arms straight. For instance if you are reaching with your left hand you can backstep with your left foot and keep your right arm straight. Thus using your leg muscles rather than your upper body to push you in the direction you wish to go. Backstepping is very useful when holding onto sidepulls and underclings.

When warming up try back stepping every move with only one foot on. If you are reaching with your right hand keep your right foot on, and if you are reaching with your left hand keep

your left foot on. This will not always make the move easier but at least you will learn when it works and when it does not.

Rotating

Rotating is very important for conserving energy and momentum while climbing. Allowing the weight of your body to carry you through one move and into the next. When rotating it is important to keep contact with the foothold so you need to place your feet in such a way that rotating your foot will not cause it to come off (stand near the front of your shoes and be prepared to drop the heel). Start with your hands crossed on two side pulls at chest height, and about one foot apart. Place both feet on decent footholds about 3-4 feet directly below the hand holds. Now if you are reaching out with your right hand you want to rotate on your right foot, moving the weight from your big toe to a back step. Concentrate on dropping your heel and not losing contact with the foot hold. You will learn where the sweet spot is for your shoes, and for most shoes it is different. Try and reach as far as possible with your right hand and then come back to the starting position. Repeat for your left hand. Rotations are very important for cross overs and maintaining momentum so practice while warming up. Try and rotate every move, obviously this is not always desired but you will learn when it works and when it does not. Try and climb easier routes with just straight arms to see how rotating will help you.

THE MEANING OF TECHNIQUE IN DIFFERENT SPORTS

The concept "technique" does not have the same meaning in all sports. The factors previously studied play a different role for every sport.

In order to determine the different meaning of a technical concept, it is necessary to analyse each sport specialty independently.

Verjoshanskij (1985) develop different meanings of technique even within the same sport (athletics). For explosive strength specialties, he states that the technique must guarantee the capacity of producing a strong and concentrated impulse just at the determinant phase of execution.

Neumeier (1981) also states that at this determinant phase of execution the role of the technique is to reach maximal acceleration. We can see, then, that there is a clear concurrence of concepts (dynamic-cinematic).

While for endurance events the technique is efficacy or performing a skill economically (temporal and kinesiologic factors are the most relevant). Thus, their techniques must be learnt differently.

For sports practiced with an opponent, Gulinelli (1986) understands technique as the possibility to solve variable competitive situations. On the other, Djatschkov (1977) states that technique must develop precise strength and speed executions to the maximal extend. In this case internal-informative and external-temporal values are the most determinant. Therefore, such factors must be taught preferentially in order to develop technical skills adequated to the competitive needs.

Gulinelli (1986) holds that in artistics sports the technique have to increase the precision and expressivity of movement (external-aesthetic assessment, and internal-informative and psychological assessments are the most important). Evidently, it is necessary to understand the meaning of technique before the selection of a training model. The proposed analysis allows the coach to design very efficiently the learning objectives of a concrete technique, the first step of any learning plan.

TECHNICAL ASSESSMENT

The observation of a technique can be assessed from a formal and a real point of view.

The formal assessment consist of an analysis of the similarity between a technical execution and its scientific ideal model. It is an objective assessment. In some sports (gymnastics, figure skating, etc) the athlete's performance is evaluated with such formal criterion. A judge, trained to observe, give an score that assesses the execution of this type of technical skill. In other words, there exist a direct concurrence technique-result; therefore, such formal assessment is equivalent to a real assessment of the result.

Real assessment is based on the result, independently from the similarity between a technical execution and its ideal model.

An athlete can perform scoring many goals and having a poor model of the throwing technique. Thus, it is an indirect measurement or assessment of technique. On the other hand, in some athletics specialities to have a technique similar to a model is a guarantee to perform at high level. An athlete who does not know the jumping hurdles technique cannot obtain a good result in those specialities, although the technique is not evaluated, but the time (an indirect assessment of technique). Therefore, the indirect assessment conditions of a technique permit to classify sports, at least, in these two cited groups. What it is really relevant is to know how technique is evaluated in our sport specialty in order to plan learning and training goals depending on the real demands of that speciality.

By doing that, different technical factors will be emphasized for each learning stage.

TECHNICAL TRAINING

By the technical analysis we have the knowledge of all factors that can be taught in order to improve the technical skill of a particular athlete. Knowing the meaning of technique allow us to classify the importance of all these factors and, therefore, to clearly define the goals. Finally, with the evaluation of the technical skill in different sports, we can fix its relative importance and plan in sequence the learning goals during the athlete's sport life. It is now time to discuss how to improve a technical skill; however, it is impossible to describe all the training process of all different sports, due to the nature of this article. We are going to tackle the questions of the influential aspects in acquiring a sport technique and the proposal of a model based on learning stages.

To learn technical abilities, besides motor learning, requires also another learning that permits to adjust an athlete's motor activity to the predominant circumstances of a sport competition. Technical training requires a more complex improvement of various capacities. Thus, it is not only necessary to achieve a motor learning, but also a perceptual and decisional learning in order to achieve all learning needs which are required for a high level sport practice. These three type of learning must grow up

homogeneously to perform in different sports; however, in each sport they will be emphasized particularly. For instance, Mandoni (1985) proposes the following learning that must be reached in beginner basketball players:

- Learning of signals (stimulus-answer).
- Learning of connections (stimulus-answer, without linking).
- Linking of various stimulus-answers.
- Learning of concepts.
- Learning of rules.

In this proposal perceptual and decisional learning are more emphasized than motor learning, while in other type of sports may happen the contrary.

All in all, there is a group of factors that will influence when learning new sport techniques of any speciality:
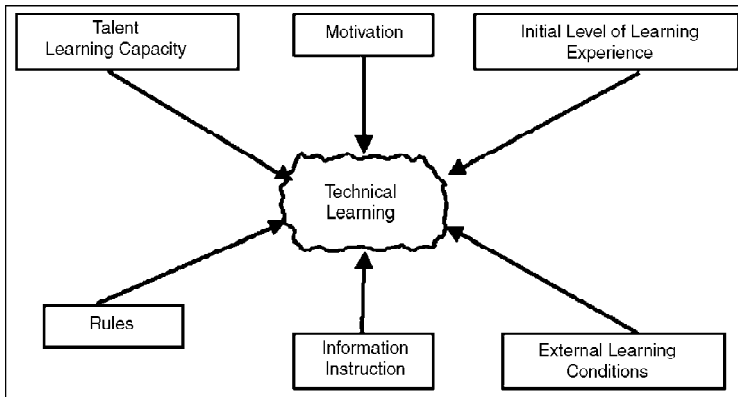
On the other hand, technical training is a more complex process that affects the improvement of all technical factors, and it includes among them the motor learning as well as all other components set out.

The training that is performed by execution of movements is the most meaningful in a training practice. This body motion can be aim towards the perfecting of movement, by improving its execution, or it also can be aim towards the acquisition of conditioning factors which improve the performance of a skill. In other words, to increase the value of both coordination and conditioning capacities of the athlete.
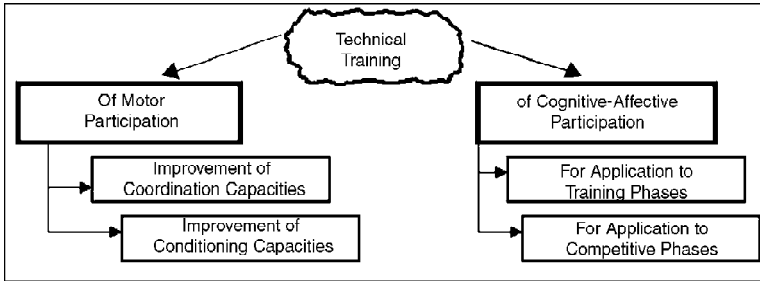
- In order to improve coordination capacities Manno (1984) proposes motor execution goals in conditions that assure the participation of all coordination capacities and specially the predominant coordination capacities in a concrete sport speciality. He makes a proposal, about the coordination of a desired motor act. A specific orientation of the objectives and the achievement of several trials under certain conditions, allow the learning of a particular movement, the learning of a concrete sport technique. Matveev (1982) asserts that "as soon as a movement is becoming usual, by a big increase in the amount of repetitions, this exercise no longer has any influence on the coordination capacities" and proposes a "systematic renewal of motor experiences" for constantly influence on coordination capacities. Added to that, motor learning is a part of training of the coordination capacities.
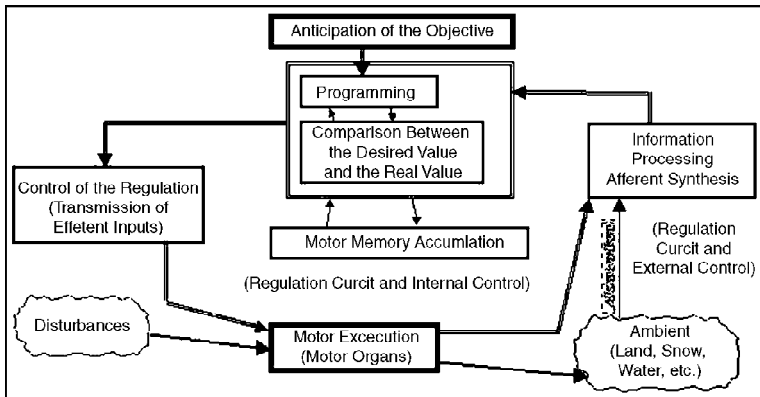
- The improvement of conditioning capacities is another facet of the motor participation training. It is done by the application of concrete systems which improve these factors. There exist well known systems to improve strength, speed or endurance, as well as flexibility and relaxation. We want to point out the importance of having an homogeneity in these two options of motor participation goals, which provides a balance of the technical behaviour and a continuous possibility of progress throughout the sport carrier of an athlete.

The technical training of cognitive-affective participation is commonly underestimated, supposing that the simple participation of such values in any physical practice means already its training. It is not really like that and Duran (1985) systematize all required operations to plan a motor answer that makes evident the need to improve these type of capacities in which it is not necessary a motor participation for its training.

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┌─────────────────────────────────────────────────┐
│   ┌───────────────────────────┐                  │
│ ─▶│      Set Out a Goal        │                 │
│   └───────────────────────────┘                  │
│         │            │                            │
│         ▼            ▼                            │
│ ─▶┌────────────────────────────────────────────┐ │
│   │ Break the Goal Down in to in Termediate Sub-Goals │ │
│   └────────────────────────────────────────────┘ │
│   ┌────────────────────────────────────────────┐ │
│   │ To Mentally Recall the Possible Solutions:  │ │
│   │ Movement Presentation                       │ │
│   └────────────────────────────────────────────┘ │
│         │                                         │
│         ▼                                         │
│   ┌────────────────────────────────────────────┐ │
│   │   Anticipated Evaluation of Solutions       │ │
│   └────────────────────────────────────────────┘ │
│         │            │                            │
│         ▼            ▼                            │
│   ┌────────────────────────────────────────────┐ │
│   │ Decision Taking-Proposal of the Answer      │ │
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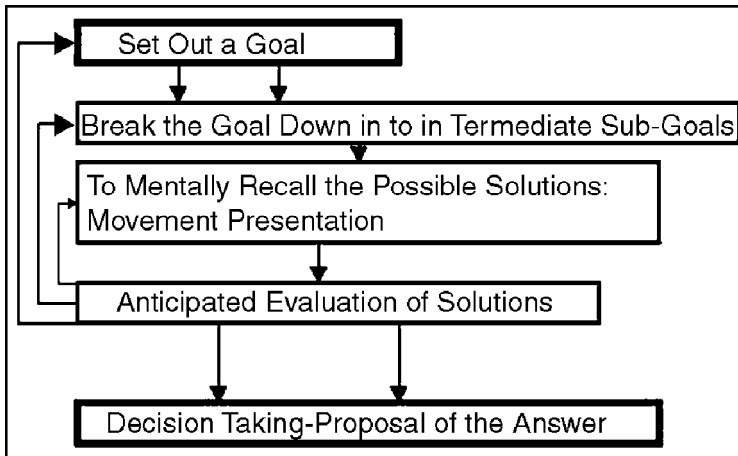
After these "mental practices" the motor execution is performed, under conditions similar to the designed proposals in the preceding plan. Once the movement has been executed, it is necessary to evaluate it, taking again value cognitive-affective capacities for being able to perform the following operations proposed by Duran on the figure.
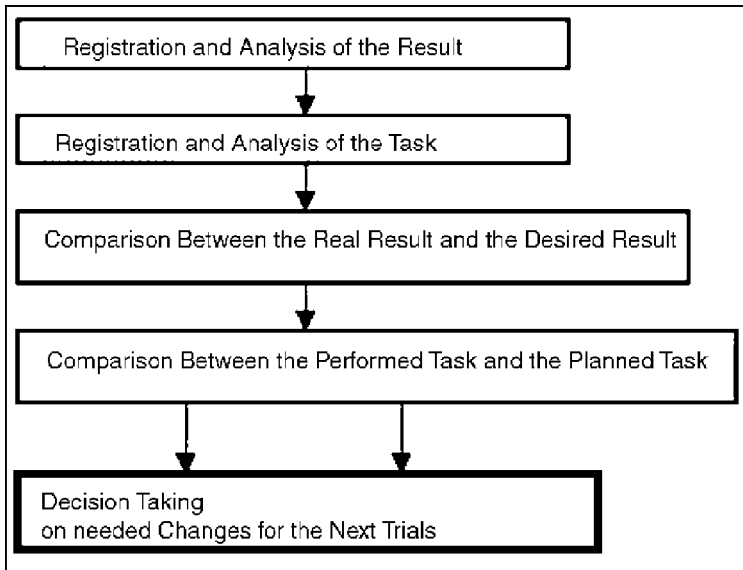
In such type of mental operations become apparent, both during training practices and during competitions, that the participations of cognitive capacities allows a technical execution be adjusted to the activity purpose of an athlete; and if the planning has bigger cognitive participation, the answer has both cognitive and affective values
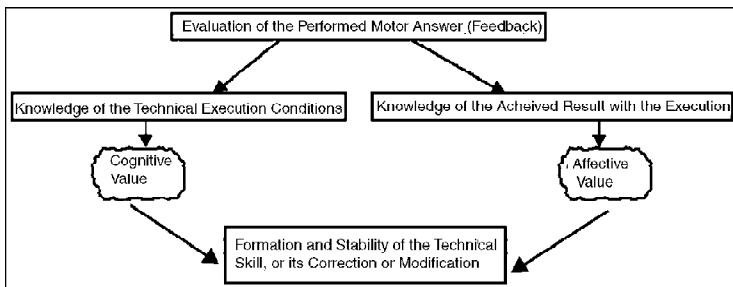
Volpert (1976) proposes different possibilities of technical training without motor activity, therefore it permits to improve certain cognitive capacities. The representation of such training systems. Based on Volpert, Reider (1985) define the following cognitive objectives to practice:

- To improve the representation capacity of movement.

- To improve anticipation processes.
- Conscious perception of each information type (kinestesic, visual, tactile, acoustic).
- To improve observation capacities.
- To improve the capacity to compare the expected result with the real one.
- Motor schemes with attention focus.
- To improve the concentration capacity.
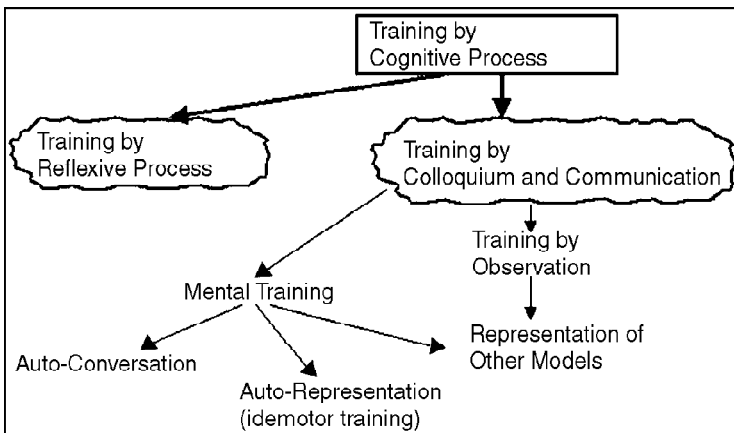
The achievement of such goals allows to develop more specific training methods so as to avoid execution mistakes which are based on the athlete's comprehension (cognition) of his own technical performance.

For instance, Pöhlmann (1977), based on the called "principle of discrimination or clarification", proposes attempts with artifacts of different weights in order to solve, by kinestesic differentiation, determined execution problems in relation, basically, to the application of forces.

There also exist options based on mistakes, proposed by Korengerg (1980), for knowing the real origin of errors during the execution of technical skills. Added to that, based on Meinel and Schnabel (1977), the cognitive processes attain great stability in the sportsman with reference to motor execution of technique for reaching his high performance in any circumstance (called "constancy of movement"). Cognitive processes have also an important participation in eliminating the called "speed's barrier"

or "speed's block" (Ozolín, 1980 and Hollmann-Hettinger, 1980); in addition to other applications during training and competition.

Therefore, during the process of technical training is necessary to apply skills of motor participation as well as skill of cognitive-affective participation, which make its application more complex and extend it to, practically, a person's sport life. It would be necessary to use different methods depending on what an athlete needs to improve his technique. Evidently, each of these training options are more or less effective to reach some or others technical goals that must be achieved during the course of different formation stages of the technical ability.

Chapter 11

Principles of Exercise and Sports Training

BENEFITS OF EXERCISE

Healthy persons as well as many persons with cardiovascular disease, including those with heart failure, can improve exercise performance with training. This improvement is the result of increased ability to use oxygen to derive energy for work. Exercise training increases maximum ventilatory oxygen uptake by increasing both maximum cardiac output (the volume of blood ejected by the heart per minute, which determines the amount of blood delivered to the exercising muscles) and the ability of muscles to extract and use oxygen from blood. Beneficial changes in hemodynamic, hormonal, metabolic, neurological, and respiratory function also occur with increased exercise capacity.

These changes can also benefit persons with impaired left ventricular function, in whom most adaptations to exercise training appear to be peripheral and may occur with low-intensity exercise. Exercise training results in decreased myocardial oxygen demands for the same level of external work performed, as demonstrated by a decrease in the product of heart rate × systolic arterial blood pressure (an index of myocardial oxygen demand). These changes are also beneficial in persons with coronary artery disease, who after exercise training may attain a higher level of physical work

before reaching the level of myocardial oxygen requirement that results in myocardial ischemia.

Exercise training favourably alters lipid and carbohydrate metabolism. The exercise-induced increase in high-density lipoproteins is strongly associated with changes in body weight, and greater increases in high-density lipoproteins have been found in women who exercise at higher levels of recreational running. Regular exercise in overweight women and men enhances the beneficial effect of a low-saturated fat and low-cholesterol diet on blood lipoprotein levels.

Endurance training has effects on adipose tissue distribution, and the effect on adipose tissue distribution is likely to be important in reducing cardiovascular risk. Exercise training also has an important effect on insulin sensitivity, and intense endurance training has a highly significant salutary effect on fibrinogen levels of healthy older men. In addition, recent data support the role of physical activity in the prevention and treatment of osteoporosis and certain neo-plastic diseases, notably colon cancer.

Developing and maintaining aerobic endurance, joint flexibility, and muscle strength is important in a comprehensive exercise programme, especially as people age. Elderly women and men show comparable improvement in exercise training, and adherence to training in the elderly is high. Resistance training exercise alone has only a modest effect on risk factors compared with aerobic endurance training, but it does aid carbohydrate metabolism through the development or maintenance of muscle mass and effects on basal metabolism. Furthermore, resistance training is currently recommended by most health promotion organisations for its effects on maintenance of strength, muscle mass, bone mineral density, functional capacity, and prevention and/or rehabilitation of musculoskeletal problems (eg, low back pain). In the elderly, resistance training is both safe and beneficial in improving flexibility and quality of life.

Persons with cardiovascular disease are usually asked to refrain from heavy lifting and forceful isometric exercises, but moderate-intensity dynamic strength training is safe and beneficial in persons at low risk.

Many activities of daily living require more arm work than leg work. Therefore, persons with coronary artery disease are advised to use their arms as well as their legs in exercise training. The arms respond like the legs to exercise training both quantitatively and qualitatively, although ventilatory oxygen uptake is less with arm ergometry. Although peak heart rates are similar with arm and leg exercise, heart rate and blood pressure response during arm exercise is higher than leg exercise at any submaximal work rate. Therefore, target heart rates are designated 10 beats per minute lower for arm training than for leg training. Dynamic arm ergometry is usually well tolerated by persons with coronary artery disease; however, there may be an increase in blood pressure that may be of concern in certain persons.

Maximum ventilatory oxygen uptake drops 5 per cent to 15 per cent per decade between the ages of 20 and 80, and a lifetime of dynamic exercise maintains an individual's ventilatory oxygen uptake at a level higher than that expected for any given age. The rate of decline in oxygen uptake is directly related to maintenance of physical activity level, emphasizing the importance of physical activity. Middle-aged men and women who work in physically demanding jobs or perform moderate to strenuous recreational activities have fewer manifestations of coronary artery disease than their less active peers. Meta-analysis studies of clinical trials reveal that medically prescribed and supervised exercise can reduce mortality rates of persons with coronary artery disease.

In addition to the physical benefits of exercise, both short-term exercise and long-term aerobic exercise training are associated with improvements in various indexes of psychological functioning. Cross-sectional studies reveal that, compared with sedentary individuals, active persons are more likely to be better adjusted, to perform better on tests of cognitive functioning, to exhibit reduced cardiovascular responses to stress, and to report fewer symptoms of anxiety and depression. In one report persons who increased their activity levels between 1965 and 1974 were at no greater risk for depression than those individuals who were active all along; however, persons who were active and became inactive were 1.5 times as likely to become depressed by 1983 compared with those who maintained an active lifestyle.

Longitudinal studies have also documented significant improvement in psychological functioning. Exercise training reduces depression in healthy older men and in persons with cardiac disease or major depression. Exercise also improves self-confidence and self-esteem, attenuates cardiovascular and neurohumoral responses to mental stress, and reduces some type A behaviours. Although exercise training generally has not been found to improve cognitive performance, short bouts of exercise may have short-term facilitative effects.

Despite the positive physical and mental health benefits of exercise, long-term adherence to exercise programmes remains problematic. It is estimated that only 50 per cent of all persons who initiate an exercise programme will continue the habit for more than 6 months. The issue of non-adherence is particularly important because exercise is only beneficial if it is maintained for extended periods of time. Thus, it is important to develop strategies to improve exercise initiation and adherence, especially for persons who are among the least active—some African-American women, the less educated, the obese, and the elderly.

IMPLEMENTATION OF EXERCISE PROGRAMMES

Persons of all ages should include physical activity in a comprehensive programme of health promotion and disease prevention and should increase their habitual physical activity to a level appropriate to their capacities, needs, and interest.

Activities such as walking, hiking, stair-climbing, aerobic exercise, calisthenics, resistance training, jogging, running, bicycling, rowing, swimming, and sports such as tennis, racquetball, soccer, basketball, and "touch" football are especially beneficial when performed regularly. Brisk walking is also an excellent choice. The training effect of such activities is most apparent at exercise intensities exceeding 40 per cent to 50 per cent of exercise capacity. (Exercise capacity is defined as the point of maximum ventilatory oxygen uptake or the highest work intensity that can be achieved.) Evidence also supports that even low- to moderate-intensity activities performed daily can have some long-term health benefits and lower the risk of cardiovascular disease. Low-intensity activities generally range from 40 per cent

to 60 per cent of maximum capacity. The 40 per cent to 60 per cent of maximum capacity range is similar for young, middle-aged, and elderly persons. Such activities include walking for pleasure, gardening, yard work, house work, dancing, and prescribed home exercise. For health promotion, dynamic exercise of the large muscles for extended periods of time (30 to 60 minutes, three to six times weekly) is recommended. This may include short periods of moderate intensity (60 per cent to 75 per cent of maximal capacity) activity (approximately 5 to 10 minutes) that total 30 minutes on most days.

Resistance training using eight to 10 different exercise sets with 10 to 15 repetitions each (arms, shoulders, chest, trunk, back, hips, and legs) performed at a moderate to high intensity (for example, 10 to 15 pounds of free weight) for a minimum of 2 days per week is recommended.

Physical activity may have risks as well as benefits, although risks are relatively infrequent. Estimates of sudden cardiac death rates per 100000 hours of exercise range from 0 to 2 per 100000 in general populations and from 0.13 per 100000 to 0.61 per 100000 in cardiac rehabilitation programmes. Studies have also demonstrated the cardiovascular safety of maximum strength testing and training in healthy adults and low-risk cardiac patients. Falls and joint injuries are additional risks associated with physical activity (especially in older women), but most of these injuries do not require medical treatment. The incidence of such complications is less in those participating in low-impact activities such as walking.

Medical Professionals

Preventive services are an important component of the national health agenda. Physicians have the opportunity and responsibility to promote regular physical activity as well as the reduction of high blood pressure, weight control, management of abnormal blood lipids, and prevention and cessation of smoking.

Many physicians may delegate the task of providing preventive services to other members of the health care team. However, the physician must set and support the agenda, because staff members under a physician's supervision cannot deliver

preventive services unless the physician defines the services as medically appropriate.

Physical activity counseling protocols that require only a few minutes of physician time are available. The physician must not neglect this responsibility to promote regular exercise and other health promotion strategies. Sex bias in the referral of women to exercise programmes has been described and should be avoided. In addition, women in cardiac rehabilitation programmes have higher dropout rates and more compliance problems, and such issues must be addressed.

Nurses, an integral part of the health care team, may assess physical activity habits, prescribe exercise, and monitor responses to exercise in healthy persons and cardiac patients. The services of physical and occupational therapists, exercise scientists, and other health professionals are also useful.

Persons with known or suspected cardiovascular, respiratory, metabolic, orthopedic, or neurological disorders should consult their personal physician before beginning or significantly increasing physical activity. Middle-aged or older sedentary persons with symptoms of cardiovascular disease should also seek medical advice.

In turn, physicians should give advice according to recommended guidelines for exercise in such persons. In addition, physicians should encourage their sedentary patients to adopt a more active lifestyle, emphasizing the risks associated with inactivity. Walking should be advocated as a mode of exercise. Physicians should assess each patient's physical activity pattern and, with the support of other health professionals, prescribe and give advice about physical activity with individual needs and capabilities in mind. They should also provide systematic follow-up. An appropriate medical evaluation, including an exercise test, may be necessary for some persons but not for the apparently healthy person less than 40 years old who has no coronary risk factors and plans to begin a moderate-intensity activity programme.

The exercise test can, however, be an important basis for appropriate exercise prescription. In some instances it is recommended that persons with known cardiovascular disease undertake a prescribed, medically supervised exercise programme

to reduce morbidity and mortality. In addition to supervised group programmes for coronary patients, alternative approaches to delivery of cardiac rehabilitation services such as home-based programmes have been tested and shown to be safe and to provide beneficial outcomes in carefully selected and stable low- to moderate-risk persons. Annual exercise testing may be an important part of monitoring certain persons with coronary artery disease.

Medical schools, residency, and fellowship training programmes should prepare physicians to recommend exercise. An individual's customary physical activity level should be an integral part of a comprehensive medical history. Professionals with a background in exercise science should work with medical personnel to establish appropriate exercise programmes for persons with diagnosed health problems or who are at high risk for developing major health problems.

Parents

Parents must know the health benefits of regular physical activity and how exercise contributes to quality of life in order to incorporate physical activity into their daily lives and those of all family members. Moreover, parents should teach their children that proper physical activity is a fundamental part of normal healthy living. This commitment provides an incentive, sets an example, and creates in children a positive attitude towards physical activity. Parents and other family members must support each other's exercise habits by sharing responsibilities such as child care, food preparation, and shopping. Families at high risk for cardiovascular disease benefit from structured programmes focused on specific health-behaviour changes.

Schools

Children must be introduced to the principles of regular physical exercise and recreational activities at an early age. Schools at all levels must develop and encourage positive attitudes towards physical exercise, providing opportunities to learn physical skills and perform physical activities, especially those that can be enjoyed for many years. The school curriculum should not

overemphasize sports and activities that selectively eliminate children who are less skilled. Schools must teach the benefits of exercise and the development and maintenance of exercise and exercise conditioning throughout life. Some studies demonstrate that organised school programmes are not only feasible but successful. In addition, these programmes can be used to promote proper nutrition and cigarette smoking prevention and cessation.

Employers and Community Groups

Employers and community organisations must develop both short- and long-term plans tailored to the needs of persons in the community and workplace. Communities should develop exercise programmes using local club, park, recreational, church, and school facilities. There is increasing evidence that worksite programmes with a comprehensive approach to employee health, including prevention and cessation of smoking, dietary intervention, and exercise, whether on-site or nearby, are not only effective in modifying coronary risk factors but also help reduce absenteeism, accidents, health care costs, hospital admissions, and days of rehabilitation. Baseline assessment of an employee's health status can be performed at a relatively low cost and should include an assessment of physical conditioning. Public health interventions in the workplace have resulted in an increase in vigorous physical activity by participating employees that is associated with increases in objective measurements of physical conditioning. As health care costs continue to increase, these programmes will become more attractive to both small and large businesses.

Insurance Industry

The insurance industry, including managed care, and the medical community are encouraged to engage in a collaborative effort to provide policyholders with exercise programmes that meet American Heart Association standards and the Agency for Health Care Policy and Research Guidelines for Cardiac Rehabilitation.

ADDITIONAL RESEARCH AND FUTURE ISSUES

There is a large body of knowledge on exercise, but data on exercise and its effects on the cardiovascular system and long-

term survival are still limited. The responsibility for conducting research lies with government, private health agencies, the insurance industry, employers, universities, and medical schools.

Basic knowledge of the anatomic, biochemical, and physiological changes that result from various patterns of physical activity (short and long term, sustained and intermittent, isotonic and isometric, low and high intensity) in persons of different ages is needed, as is a determination of whether a certain minimum-intensity threshold of physical activity is required for benefit. The biomedical and economic impact of participation in exercise programmes on coronary artery disease, cerebrovascular and peripheral vascular disease, heart failure, and hypertension should also be evaluated. The psychosocial functioning of persons with coronary artery disease and the potential value of exercise in enhancing the quality of life of cardiac and other patients warrants further study. Future studies should include adequate numbers of women, ethnic groups, and the elderly to better meet research objectives.

Furthermore, the presence and extent of coronary risk factors in the disabled and disadvantaged and in minority groups must be better identified and defined. Consequently, the effect of modifications such as increases in physical activity on members of these groups should be explored, and large studies should also include a significant number of these persons.

Research should be continued to establish the cost-effectiveness of physical activity programmes for the enhancement of cardiovascular health, with a focus on the type of promotional strategies required for initiating and maintaining physical activity (eg, insurance incentives, health personnel, public policy, and media materials) as well as the social context of such activity (eg, industry and business, rural and urban settings, schools, churches, and families). Research should also involve issues such as how physical activity can prevent (or decrease the duration of) hospitalisation of patients with cardiovascular disease.

Societal, cultural, ethnic, and personal factors that affect development or maintenance of lifelong patterns of physical activity should be identified and incorporated into strategies of exercise promotion.

Research on better and more effective physical activity interventions that improve long-term compliance to a physically active lifestyle is urgently needed. Innovative, non-traditional methods of increasing physical activity in the population must be developed, implemented, and evaluated.

TRAINING PRINCIPLES

WHY DO PEOPLE GET INVOLVED IN PHYSICALS ACTIVITY?

People get involved in exercise for a number of reasons: to improve their health and physical condition, to achieve a sporting ambition, to relive the tension and stress of daily life, to lose weight, it makes them feel good. Participating in sport encourages co-operation in team sports, develops the element of competitiveness, provides a physical challenge and the opportunity to meet new people and make new friends.

PRINCIPLES OF TRAINING

Training to improve an athlete's performance obeys the principles of training: specificity, overload, recovery, adaptation and reversibility.

Specificity

To improve the range of movement for a particular joint action, you have to perform exercises that involve that joint action. It is quite possible for an athlete to have good mobility in the shoulder joint but to have poor hip mobility. Conducting shoulder mobilityexercises may further improve the shoulder mobility but it will not affect hip mobility.

In addition to developing general levels of all round mobility in an athlete, coaches need to consider the specific mobility requirements of a given event. The coach can analyse the technique of his/her event, identify which joint actions are involved and determine which need to be improved in terms of the range of movement.

A thrower, for example, might require improvements in his/her shoulder and spine mobility. A hurdler might need to develop his/her hip mobility.

The amount and nature of the mobility training required by each athlete will vary according to the individual athlete's event requirements and his/her individual range of movement for each joint action. It may be necessary to measure the range of movement for particular joint actions to determine the present range and future improvement.

Specificity is an important principle in strength training, where the exercise must be specific to the type of strength required, and is therefore related to the particular demands of the event. The coach should have knowledge of the predominant types of muscular activity associated with his/her particular event, the movement pattern involved and the type of strength required. Although specificity is important, it is necessary in every schedule to include exercises of a general nature (*e.g.* power clean, squat). These exercises may not relate too closely to the movement of any athletic event but they do give a balanced development and provide a strong base upon which highly specific exercise can be built.

To use heavy throwing implements or weighted belts may seem the obvious solution to the specificity problem, but it is probable that by doing so the athlete will unconsciously develop compensatory movements in his/her technique in adjusting to the new weight.

Most authorities consider that in the throwing events the training implement should be kept within 15 per cent of the competition weight. Can we be specific in the speed of movement? Training at low velocity increases low velocity strength substantially but has little effect on high velocity strength.

Is there then any justification for slow velocity strength training for athletes who have to perform movements at great speed? Yes. Slow velocity training may be of value in stimulating maximum adaptation within the muscle. Muscle growth (and increase in contractile strength) is related to the amount of tension developed within the muscle.

When an athlete performs high velocity strength work, the force he/she generates is relatively low and therefore fails to stimulate substantial muscular growth. If performed extensively the athlete may not be inducing maximum adaptation with the

muscles. It is important therefore for the athlete to use fast and slow movements to train the muscles.

Overload

When an athlete performs a mobility exercise, he/she should stretch to the end of his/her range of movement. In active mobility, the end of the range of movement is known as the active end position. Improvements in mobility can only be achieved by working at or beyond the active end position.

- Passive exercises involve passing the active end position, as the external force is able to move the limbs further than the active contracting of the agonist muscles.
- Kinetic mobility (dynamic) exercises use the momentum of the movement to bounce past the active end position.

A muscle will only strengthen when forced to operate beyond its customary intensity. The load must be progressively increased in order to further adaptive responses as training develops, and the training stimulus is gradually raised. Overload can be progressed by:

- Increasing the resistance *e.g.* adding 5kg to the barbell.
- Increasing the number of repetitions with a particular weight.
- Increasing the number of sets of the exercise (work).
- Increasing the intensity- more work in the same time, *i.e.* reducing the recovery periods.

Recovery

Rest is required in order for the body to recover from the training and to allow adaptation to take place.

Adaptation

The body will react to the training loads imposed by increasing its ability to cope with those loads. Adaptation occurs during the recovery period after the training session is completed. If exercises lasting less than 10 seconds (ATP-CP energy system) are repeated with a full recovery (approximately 3 to 5 minutes) then an adaptation in which stores of ATP and CP in the muscles are increased. This means more energy is available more rapidly and

increases the maximum peak power output. If overloads are experienced for periods of up to 60 seconds, with a full recovery, it is found that glycogen stores are enhanced.

The most noticeable effect of weight training with heavy loads on fast twitch muscle fibres is larger and stronger muscles (hypertrophy).

The rate of adaptation will depend on the volume, intensity and frequency of the exercise sessions. In their recent investigation Burgomaster et al. (2008) reports that 6 weeks of low-volume, high-intensity sprint training induced similar changes in selected whole-body and skeletal muscle adaptations as traditional high-volume, low-intensity endurance workouts undertaken for the same intervention period.

Hawley (2008) states that the time of adaptation may be quicker for high-intensity sprint training when compared to low-intensity endurance training, but that over a longer period, the two training regimens elicit similar adaptations.

Reversibility or Detraining

Improved ranges of movement can be achieved and maintained by regular use of mobility exercises. If an athlete ceases mobility training, his/her ranges of movement will decline over time to those maintained by his/her other physical activities.

When training ceases the training effect will also stop. It gradually reduces at approximately one third of the rate of acquisition. Athletes must ensure that they continue strength training throughout the competitive period, although at a much reduced volume, or newly acquired strength will be lost.

Detraining Risk for Athletes

The effects of a long period of inactivity on physical fitness comes from a UK case study of an Olympic rower, who took more than 20 weeks to fully recover his fitness after an eight-week lay-off.

Although the athlete in question took the time off in response to the need for a physical and mental break rather than because of illness and injury, this case study has clear implications for injured athletes.

The athlete, an elite heavyweight male rower and current Olympic champion, allowed himself the luxury of eight weeks of inactivity after competing in the Sydney Olympic Games in September 2000. His fitness was assessed by means of a lab-based incremental rowing test on four separate occasions: eight weeks before the Olympics; after eight weeks of inactivity; after eight weeks of retraining; and after a further 12 weeks of training.

The key findings were as follows: After eight weeks' detraining:

- V02peak had decreased by 8 per cent. After eight weeks of retraining it had increased by only 4 per cent, returning to just below pre-Olympic values after a further 12 weeks;
- Power at peak oxygen consumption fell from a pre-Olympic value of 546W to 435W - a reduction of 20 per cent. After eight weeks' retraining it had increased by 15 per cent, resuming pre-Olympic values after a further 12 weeks;
- Power at reference blood lactate concentrations declined by 27 per cent, but returned to just below or just above pre-Olympic levels after 20 weeks' retraining.

The researchers recommend that training programmes should limit periods of complete inactivity to no more than two to three weeks. Prolonged periods of inactivity should be avoided and the training programme should incorporate some form of "maintenance" training where a prolonged break is desired.

PRINCIPLES OF SPORT TRAINING AND EXERCISE

INDIVIDUALITY

Everyone is different and responds differently to training. Some people are able to handle higher volumes of training while others may respond better to higher intensities. This is based on a combination of factors like genetic ability, predominance of muscle fibre types, other factors in your life, chronological or athletic age, and mental state.

Specificity

Improving your ability in a sport is very specific. If you want to be a great pitcher, running laps will help your overall

conditioning but won't develop your skills at throwing or the power and muscular endurance required to throw a fastball fifty times in a game. Swimming will help improve your aerobic endurance but won't develop tissue resiliency and muscular endurance for your running legs.

Progression

To reach the roof of your ability, you have to climb the first flight of stairs before you can exit the 20th floor and stare out over the landscape.

You can view this from both a technical skills standpoint as well as from an effort/distance standpoint. In order to swim the 500 freestyle, you need to be able to maintain your body position and breathing pattern well enough to complete the distance. In order to swim the 500 freestyle, you also need to build your muscular endurance well enough to repeat the necessary motions enough times to finish.

Overload

To increase strength and endurance, you need to add new resistance or time/intensity to your efforts. This principle works in concert with progression. To run a 10-kilometer race, athletes need to build up distance over repeated sessions in a reasonable manner in order to improve muscle adaptation as well as improve soft tissue strength/resiliency. Any demanding exercise attempted too soon risks injury. The same principle holds true for strength and power exercises.

Adaptation

Over time the body becomes accustomed to exercising at a given level. This adaptation results in improved efficiency, less effort and less muscle breakdown at that level. That is why the first time you ran two miles you were sore after, but now it's just a warm up for your main workout.

This is why you need to change the stimulus via higher intensity or longer duration in order to continue improvements. The same holds true for adapting to lesser amounts of exercise.

Recovery

The body cannot repair itself without rest and time to recover. Both short periods like hours between multiple sessions in a day and longer periods like days or weeks to recover from a long season are necessary to ensure your body does not suffer from exhaustion or overuse injuries. Motivated athletes often neglect this. At the basic level, the more you train the more sleep your body needs; despite the adaptations you have made to said training.

Reversibility

If you discontinue application of a particular exercise like running five miles or bench pressing 150 pounds 10 times, you will lose the ability to successfully complete that exercise. Your muscles will atrophy and the cellular adaptations like increased capillaries (blood flow to the muscles) and mitochondria density will reverse. You can slow this rate of loss substantially by conducting maintenance/reduced programme of training during periods where life gets in the way, and is why just about all sports coaches ask their athletes to stay active in the offseason.

The principles of specificity, progression, overload, adaptation, and reversibility are why practicing frequently and consistently are so important if you want to improve your performance. Missed sessions cannot really be made up within the context of a single season. They are lost opportunities for improvement. Skipping your long ride on weekend A means you can't or shouldn't go as far as originally planned on weekend B (progression and overload). Skipping your Monday swim means your swimming skills and muscles won't be honed or stressed that day (specificity). Missing a week due to a vacation sets you back more than one week (adaptation and reversibility). Apply these principles to your training to get a better understanding of your body and how to achieve success.

THE FITT PRINCIPLE OF TRAINING

Think of The FITT principle as a set of rules that must be adhered to in order to benefit from any form of fitness training programme.

These rules relate to the Frequency, Intensity, Type and Time (FITT) of exercise.

These four principles of fitness training are applicable to individuals exercising at low to moderate training levels and may be used to establish guidelines for both cardio respiratory and resistance training.

The FITT principle is used to guide the development of unique and bespoke fitness plans that cater for an individual's specific needs.

FREQUENCY

Following any form of fitness training, the body goes through a process of rebuild and repair to replenish its energy reserves consumed by the exercise.

The frequency of exercise is a fine balance between providing just enough stress for the body to adapt toand allowing enough time for healing and adaptation to occur.

1. CardioRespiratory Training The guidelines for cardiorespiratory training (also called aerobic conditioning) is a minimum of three sessions per week and ideally five or six sessions per week.

Experts suggest that little or no benefit is attained over and above this amount. Of course athletes often fall outside the suggested guidelines but even elite performers must give themselves time to rest.

2. Resistance Training The frequency of resistance training is dependent upon the particular individual and format of the programme. For example, a programme that works every body part every session should be completed 3-4 days a week with a day's rest between sessions.

On the other hand, aprogram that focuses on just one or two body parts per session, in theory you could be completed as frequently as six days per week. Many bodybuilders follow such a routine.

Remember though, each time you complete a strenuous strength training session (regardless of the body part) you are taxing your body as a whole - including all the physiological systems and major organs.

INTENSITY

The second rule in the FITT principle relates to intensity. It defines the amount of effort that should be invested in a training programme or any one session. Like the first FITT principle - frequency - there must be a balance between finding enough intensity to overload the body (so it can adapt) but not so much that it causes overtraining.

Heart rate can be used to measure the intensity of cardiorespiratory training. Workload is used to define the intensity of resistance training.

Cardiorespiratory Training

Heart rate is the primary measure of intensity in aerobic endurance training. Ideally before you start an aerobic training programme a target heart rate zone should first be determined. The target heart rate zone is a function of both your fitness level and age. Here's a quick method for determining your target heart rate.

Heart Rate and Maximum Heart Rate

Heart rate is measured as beats per minute (bpm). Heart rate can be monitored and measured by taking your pulse at the wrist, arm or neck. An approximation of maximum heart rate (MHR) can also be calculated as follows: MHR = 220 - age.

Target Heart Rate

For beginners a target heart rate zone of 50-70 per cent of their maximum of heart rate is a good place to start. So if, for example, you are 40 years old that gives you a predicted maximum heart rate of 180 (220 - 40). Multiply 180 by 50 per cent and 70 per cent and your reach a target zone of 90bpm - 126bpm.

For fitter, more advanced individuals, a target heart rate zone of 70-85 per cent of their maximum of heart rate may be more appropriate. Staying with the example above, that 40 year old now has a heart rate zone of 126bpm - 153bpm. There are limitations with heart rate and the heart rate reserve method, while no means flawless, may be a more accurate way to determine exercise intensity.

Resistance Training

For resistance training, workload is the primary measure of intensity. Workload can have three components:
1. The amount of weight lifted during an exercise
2. The number of repetitions completed for a particular exercise
3.   The length of time to complete all exercises in a set or total training session

So, you can increase workload by lifting heavier weights. Or you could increase the number of repetitions with the same weight. Finally, you could lift the same weight for the same number of repetitions but decrease the rest time between sets. However, only increase the intnesity using one of the above parameters. Do not increase weight and decrease rest time in the same session for example.

TYPE

The third component in the FITT principle dictates what type or kind of exercise you should choose to achieve the appropriate training response.

Cardiorespiratory Training

Using the FITT principle, the best type of exercise to tax or improve the cardiovascular system should be continuous in nature and make use of large muscle groups. Examples include running, walking, swimming, dancing, cycling, aerobics classes, circuit training, cycling etc.

Resistance Training

This is fairly obvious too. The best form of exercise to stress the neuromuscular system is resistance training. But resistance training does not neccessarily mean lifting weights. Resistance bands could be used as an alternative or perhaps a circuit training session that only incorporates bodyweight exercises.

TIME

The final component in the FITT principle of training is time - or how long you should be exercising for. Is longer better?

Cardio Respiratory Training

Individuals with lower fitness levels should aim to maintain their heart rate within the target heart rate zone for a minimum of 20-30 minutes. This can increase to as much as 45-60 minutes as fitness levels increase. Beyond the 45-60 minute mark there are diminished returns. For all that extra effort, the associated benefits are minimal.

This also applies to many athletes. Beyond a certain point they run the risk of overtraining and injury. There are exceptions however - typically the ultra-long distance endurance athletes. In terms of the duration of the programme as a whole, research suggests a minimum of 6 weeks is required to see noticeable improvement and as much as a year or more before a peak in fitness is reached.

Resistance Training

The common consensus for the duration of resistance training session is no longer than 45-60 minutes. Again, intensity has a say and particularly grueling strength sessions may last as little as 20 - 30 minutes.

Perhaps the most important principle of training (that ironically doesn't have it's own letter in the FITT principle) is rest. Exercising too frequently and too intensely hinders the body's ability to recover and adapt. As a rule of thumb, the harder you train, the more recovery you should allow for. Unfortunately many athletes don't have that luxury!

SPORTS TRAINING PRINCIPLES

The FITT principle is designed more for the general population than athletes.

Sport-specific training should be governed by a more in-depth set of principles. These include:
- Specificity
- Overload
- Adaptation
- Progression
- Reversibility
- Variation.

CHARACTERISTICS OF TRAINING IN SPORTS

Training is a complex behaviour, mainly because it is performed in a time frame that ranges from seconds to years. Sports people use numerous terms to describe the characteristics of this temporal dimension of training. Single human movements, which occur in a second or two, are combined and repeated to make a training bout or workout, a period of more-or-less uninterrupted physical activity. Workouts may occupy a few minutes or hours, and may be continuous exercise, a set of reps or repeated movements, or a set of sets. A complete training session usually lasts an hour or two and consists of one or more workouts.

The nature of each session may vary, but after a week or so a repeated pattern of sessions known as a microcycleusually emerges. A series of microcycles may constitute a phase of training, for example a build-up or speciality phase. A repeated pattern of phases or microcycles makes up a mesocycle, and a season or macrocycle of training may consist of a repeated set of mesocycles. Finally, over a period of years a training history develops.

Studies involving quantification of training focus invariably on only a small part of the training time frame. In some biomechanical applications, the focus of interest is a single movement or limited set of movements, such as a high jump or a javelin throw.

In most other applications, particularly those involving investigation of the physiological effects of training, the fundamental unit of training is the workout. Even in studies of injury and illness that focus on a season or history of training, data on typical workouts during one or more phases of training usually provide the key training variables.

Workouts vary between sports, but most can be classified as eitherendurance, interval, strength or skill. For example, in competitive track running a workout of continuous running is classified as endurance; repetition running (short periods of high-speed running separated by rests or slow-speed running) is an example of an interval workout; short sprints with a weight in tow qualifies as a strength workout; and practicing of starts is a skill workout. This classification reflects common usage by

sportspeople, but it also has an underlying theoretical basis: in general, endurance workouts train the aerobic power system, interval workouts train the anaerobic glycolytic system, strength workouts train the phosphagen system, and skill workouts train the central nervous system.

Duration and intensity are important characteristics of a training workout, because they contribute to the short- and long-term effects of the workout on the health and fitness of the athlete. In the case of an endurance workout performed at a reasonably steady pace, only one estimate of duration and intensity may be required. Interval and strength workouts involve multiple periods of work and rest, each of which may need an estimate of intensity and duration. The intensity and duration of skill workouts also need to be characterised, especially if the movements are practiced at sufficiently high intensity and for a sufficient duration to produce a training effect on the body's power systems.

The aims of a study will dictate whether other aspects of training workouts need to be assayed. For example, it may be important to determine details of clothing, equipment, training surface or medium, venue, time of day, weather, consumption of food or drink, psychological state, supervision, or perhaps even the number and calibre of training companions.

METHODS OF QUANTIFICATION

There are three groups of methods: observational (taking measurements in real time or from video recordings), physiological (monitoring heart rate, blood lactate concentration or oxygen consumption), and subjective (use of questionnaires or diaries). The methods in each group are similar in their suitability for assaying training, but there are substantial differences between groups.

The suitability of each method for assaying training in different time frames. Training in the shortest periods of time can be assayed only with observational methods, whereas the longest time frames require subjective methods. All methods, including those in the physiological group, can quantify training at the level of a workout, but the physiological methods are useful only for assaying the intensity of training of steady-state workouts.

Table. Suitability of methods for quantifying training behaviour in different time frames

	time frame of training behaviour				
	seconds	minutes	minutes-hours	days-weeks	months-years
	single movement	repetitions, intervals	workout, bout session	microcycle, phase, mesocycle	macrocycle, season, history
Observational					
real time	+ +	+ + +	+ + +	+	-
video	+ + +	+ + +	+ +	-	-
physiological[a]					
oxygen uptake	-	-	+	-	-
heart rate	-	-	+ +	+	-
blood lactate	-	-	+	+	-
Subjective					
questionnaire	-	+ +	+ +	+ +	+ +
diary	-	+	+ +	+ + +	+ +

Suitability: + + + high, + + moderate, + limited, - unsuitable.[a]Suitable for intensity of steady-state workouts only.

OBSERVATIONAL METHODS

Quantification of periods of training from a few seconds to a few weeks can be achieved simply by observing the training either in real time or on video. Practical considerations set the upper limit of the time frame: it is time-consuming for the coach or scientist to be present at every training session, and expensive if observers or video operators are employed.

Observation may also cause the athletes to train more intensely or closer to their prescription than they would otherwise do, but in general the measures obtained by observation are probably more valid than those obtained by physiological or subjective means.

Real-Time Observation

The measures usually recorded in real time are the type and duration of the workout, along with relevant split times, distances,

weights or workloads that produce measures of intensity. Special stopwatches facilitate recording of multiple times if the workout is a set of intervals. Information on other dimensions such as weather and equipment is also recorded if relevant. It is worth making a recording form with coded columns for all the necessary data. Such forms reduce the rates of error and loss of data and can be sent directly to a data-capture service.

Measures of intensity derived from observation can be expressed either inabsolute terms (*e.g.*, pace in minutes per mile) or in relative terms (*e.g.*, pace as a per cent of the athlete's personal best pace for the distance). For athletes doing resistance training with weights, an important measure of relative intensity is the repetitions maximum (RM); for example, 80 per cent of 1 RM is 80 per cent of the weight that an athlete can only just lift once. The use of relative intensity simplifies description or prescription of intensity for athletes who differ in ability.

Video

Video is a tool primarily for the coach or biomechanist interested in improving the athlete's skill. It is ideal for the analysis of single movements or intervals of exercise lasting up to a minute or two. The most cost-effective method is qualitative analysis, in which the athlete, coach or sport scientist simply view the video together and decide immediately how technique could be improved. The athlete can then attempt any recommended changes and be filmed for a further round of analysis.

Quantitative analysis involves digitisation of the video images to permit calculation of spatial and temporal relationships in the movement. Several proprietary hardware-software packages are available for the purpose. Simple but effective digitizing is also possible with minimal extra hardware and software. The procedure is time-consuming and loses the benefit of immediate feedback to the athlete, but it allows detailed comparisons of one athlete with another or of one athlete before and after an intervention.

Video has also been used for time-motion or notational analysis, in which the times spent in various modes of activity or in moving at various speeds are estimated from time and distance measurements taken from the video. As yet the method has been

employed only for quantification of the energy demands of competition rather than of training.

PHYSIOLOGICAL METHODS

Training produces many effects on the body, ranging from acute responses (*e.g.*, increase in breathing frequency during exercise) to chronic adaptations (*e.g.*, increase in blood volume and maximum oxygen consumption after a few weeks of endurance training). Some chronic adaptations find application in studies of the training of non-athletes, where they can provide objective evidence of an increase in physical activity. With athletes, only the acute responses are used to quantify training, and of these responses only three have any practical significance: oxygen consumption, heart rate, and blood lactate concentration. All three provide information only on the intensity of steady-state exercise.

The need for special apparatus to monitor physiological responses sets the upper limits on the useful time frame for these methods. Devices are now available that will allow athletes to monitor their own heart rates indefinitely, but if the data are to be collected by a researcher, several months of monitoring is difficult to achieve. Measurement of lactate concentration is also difficult to sustain for more than a few months, while oxygen consumption requires equipment that can be used realistically only for a few training sessions.

The shortest duration of training that can be monitored is set by the response time of the physiological variables to changes in exercise intensity. Oxygen consumption and heart rate take 3-4 min to reach a steady state, and blood lactate concentration takes even longer, so these variables are unable to provide readily interpretable information on the intensity of reps/intervals.

Oxygen Consumption

In theory this is a good measure of the intensity of steady-state exercise, for a number of reasons. First, training that can be sustained at a constant pace for more than a few minutes is performed with energy supplied almost entirely from consumption of oxygen. Secondly, the relationship between steady-state oxygen

consumption and power output or speed is linear over the range of intensity from rest to maximum steady state. Thirdly, oxygen consumption drifts upwards by only a few per cent in prolonged exercise performed at a constant high workload. Finally, oxygen consumption at a given workload is stable over a period of months of training, in part because exercise efficiency changes little in trained athletes.

In practice, measurement of oxygen consumption requires athletes to breathe into special apparatus to allow expired gas to be collected or analysed. This requirement limits the monitoring of training activities in the field, although several portable devices weighing only a few kilograms are now available. It is more convenient (but less representative of real training) if the activity can be performed in a laboratory on a sport-specific ergometer. Analysis of oxygen consumption is possible in real time with one of a range of available metabolic carts or with a similar computerized system of analysers of gas volume and composition; alternatively, Douglas bags can be used to store the gas for later analysis.

If analysing or collecting gas is too difficult during the training activity, it is possible to analyse or collect gas for several minutes immediately after the activity, then to calculate the oxygen consumption that occurred during the activity by back-extrapolation.

Several measures of intensity can be derived from oxygen consumption. Of the absolute measures, milliliters of oxygen per minute per kilogram of body mass ($ml.min^{-1}.kg^{-1}$) is appropriate for comparing training that involves continual changes in direction or speed, or continuous work against gravity (examples: running, off-road cycling, most team sports). Liters of oxygen per minute ($L.min^{-1}$) is better for sports like road cycling and swimming. A relative measure that is rarely, if ever, used with athletes is the met (multiple of the resting metabolic rate).

The most common relative measure is oxygen consumption expressed as a per cent of maximum oxygen consumption, which is usually determined in an incremental test to maximum effort with the same mode of exercise as the training activity. The relative oxygen consumption allows more meaningful comparison of the

training intensities of athletes who differ in body mass, performing ability, and exercise efficiency.

For reasons already stated, it is not possible to measure the intensity of short intervals of high-intensity training directly as an oxygen consumption. It is nevertheless possible to exploit the linear relationship between workload (or pace) and oxygen consumption to express the intensity of such workouts as a per cent of maximum oxygen consumption. For this purpose the oxygen consumption of several steady-state workouts is determined and plotted against workload, the line through the points is extrapolated to the higher workloads of the interval training, and the "corresponding" oxygen consumption is read off the graph.

Heart rate

This variable shows a response to exercise similar to that of oxygen consumption, so it can be used in a similar fashion to measure intensity when work load is maintained reasonably constant for more than a few minutes. Heart rate is higher if the same exercise is performed in a hotter environment. It also drifts upward more than oxygen consumption as the athlete heats up in prolonged exercise. It has the advantage over oxygen consumption of being far easier to assay.

In the laboratory heart rates are usually measured with an electrocar-diograph, but for field work a range of miniaturized cardiotachometers is available. The most reliable of these detect the electrical activity of the heart and use it to calculate heart rate. Models that store the heart rate allow the coach and sport scientist to make use of the data, which are either replayed on the watch or downloaded into a computer or special portable analysing unit. Waterproof versions can be used to monitor steady-state aquatic training. The athlete can also measure heart rate directly by palpation of an artery in the wrist or neck, but exercise has to be stopped briefly to perform the measurement and the resulting estimate is not accurate.

Heart rate can be used to express intensity in several ways. The absolute heart rate is useful for the individual athlete monitoring intensity on a day-to-day basis. Heart rate expressed

as a per cent of maximum controls for differences in the maximum heart rate between athletes. Differences in the resting heart rate can be taken into account if intensity is expressed as a per cent of heart-rate reserve: 100(training heart rate - resting heart rate)/ (maximum heart rate - resting heart rate). A practical method of specifying intensity is to express training heart rates as a per cent of race-pace heart rate. Heart rate recorded in the field can also be converted to oxygen consumption or other measure of training pace or power using relationships between heart rate and pace derived for each athlete from a series of steady-state exercise tests.

Lactate Concentration

During intense exercise lactate produced in muscle by the anaerobic glycolytic pathway diffuses into the blood and causes the blood lactate concentration to rise above the resting value 1-2 mmol.L^{-1}. If the intensity is not too high, blood lactate reaches a steady level after 10-20 min of steady exercise. The relationship between the steady level of lactate and workload is curvilinear but reproducible, which means that lactate can be used to define training intensity.

The range of intensities over which this method works is narrow: moderate intensities do not evoke increases in blood lactate, and at high intensities lactate does not reach a steady value before the athlete fatigues.

The highest intensity at which lactate stabilizes is one definition of the anaerobic threshold, and it corresponds to a blood lactate concentration of about 4 mmol.L^{-1}. Exercise at this intensity can be sustained for 30-60 min before fatigue occurs. Blood lactates are measured during training mostly for determination of the anaerobic threshold, then for prescription of intensity of training relative to the threshold. The peak value of lactate concentration reached during or following short high-intensity workouts is sometimes measured by enthusiastic sportspeople, but this practice is not useful.

Compact lactate analysers are available for determination of blood lactate concentration in a droplet of blood taken from a finger or earlobe. A portable instrument, suitable for use in the field, is also available. The analysis is rapid (1-2 min) and reliable,

although technically demanding for the non-scientist. Problems with the technique arise not from the lactate analysis itself but from variability between athletes: the intensity corresponding to a blood lactate concentration of 4 mmol.L^{-1} is perceived as moderate by some athletes and too hard to sustain by others. Even within the same athlete, variations in muscle glycogen content caused by recent training or diet can alter the lactate concentration corresponding to the anaerobic threshold. Care should therefore be taken to standardize training and diet for the few days before blood lactate is monitored.

SUBJECTIVE METHODS

Questionnaires and diaries are closely related instruments: a diary is effectively a series of self-administered questionnaires. Both instruments obtain data recalled from memory, and both can be used to assay training over all but the shortest time frames.

Questionnaires

In most respects, questionnaires are the best method for assaying training. They are quick and inexpensive to administer and they can provide data on most dimensions of training. Unfortunately no compendium of athlete questionnaires is available, few studies provide useful detail about the wording of their questionnaires, and few studies have reported on the precision of measurement of the items in a questionnaire. The researcher may therefore have to spend a considerable amount of time devising and trialing a questionnaire before using it in a study.

Questions about duration of training can be asked in terms of time spent or distance covered, depending on the sport. Duration of strength and interval training may be better defined in terms of the numbers of reps and sets rather than time spent, because the duration of the work and rest intervals is usually hard to remember or estimate. Intensity can be assayed as estimated pace or workload and expressed subsequently as relative intensity, if the athlete's personal best performance is also recorded. For some workouts it may be preferable or necessary to assay intensity as perceived effort, usually in several broad categories. A two-point scale of

intensity or effort could be simply *high* and *moderate-low;* a four-point scale could be *race-pace, hard, moderate* and *easy).*

For construction of a training questionnaire, it is important to get the help of a few good coaches or athletes who know how training sessions are organised and what terminology is used in their sport. Their advice will help make the decisions on how best to ask about duration and intensity, and whether other dimensions of training are important for the study.

The main drawback with questionnaires is errors in the responses of athletes, who may misinterpret the questions, exaggerate their training, or be unable to remember details. Measures of training derived from questionnaires are therefore usually less precise than those derived from observation or physiological monitoring. Lack of precision results in weakening of the apparent relationship between training and outcomes such as performance or injury, so it is important to estimate the precision of measures derived from questionnaires.

The precision of a measure is expressed formally as reliability and validity. Reliability of a training measure is the consistency of the measure obtained from repeated measurement of training in a sample of athletes. In the case of questionnaires, reliability is obtained simply by administering the questionnaire on two occasions. Validity describes the relationship between true training and the training obtained concurrently from the questionnaire or other instrument.

True training can never be measured perfectly, so in practice validation is a matter of comparing your measure with something better that is more difficult or costly to obtain. For example, direct observation or physiological monitoring can validate a diary. In one study a phone interview was considered to give better measures of training for validating a self-administered questionnaire.

Validation of training over a season is difficult, because it is usually unrealistic to observe or monitor athletes for more than a few training sessions. One approach is to use a retrospective questionnaire, but to validate the questionnaire against measures from a diary, then to validate a short period of diary data against objective measures taken concurrently.

The quality of data obtained from a questionnaire is determined partly by the method of administration. The worst data are obtained from self-administered questionnaires, especially those sent by mail: misinterpretation or complete omission of questions is frequent, and an acceptable compliance (rate of return, preferably at least 70 per cent) may not be achieved even after repeated reminder notices have been sent. Better data can be obtained if the athlete completes the questionnaire in the presence of an interviewer, who can answer queries and check the completed questionnaire immediately.

This technique can also be extended to a small group of athletes. The best data are obtained when one person, preferably one of the principal researchers, administers the questionnaire to each athlete, in person or by phone. In large-scale studies with several interviewers, it is important standardize procedures for recording each item. Misinterpretations and transcription errors by the interviewers will be further minimized if the questionnaire is constructed as if it were to be self-administered.

Draft versions of the questionnaire should be trialed initially on colleagues and, after revision, on a small sample of the athletes for whom it is intended. Analyse the data from this sample, because some problems become apparent only when you extract data from the questionnaires. After further revision give serious consideration to a reliability or validity study: it will make your main study more publishable. Make any minor revisions thereafter without further pilot work, but if major revision of key questions is indicated, further investigation of reliability or validity may be necessary. Now at last you are ready to use the questionnaire!

Diaries

Data from diaries are likely to be more valid than data from questionnaires, because diary entries are recorded soon after the training sessions, and an uninterrupted record of training over an extended period can be achieved. In other respects diaries present more problems than questionnaires. The greatest difficulty is with compliance, which may be acceptable at the start of a study but which may drop to an unacceptable rate as athletes lose interest. Regular collection of diary forms or regular encouragement will

lessen the drop-out rate, as will keeping the diaries short and simple. The problem of coding a large amount of diary data can be avoided if athletes are provided with a diary sheet designed to permit direct recording of responses into numbered columns ready for data capture.

Pilot studies are as necessary for a newly-devised diary as they are for a questionnaire. Reliability is not worth determining for a daily diary, because the necessary close proximity of the test and retest will make high correlations inevitable. On the other hand, investigation of validity is much more feasible for a diary than for a questionnaire, because the short time interval represented by a diary entry can be observed or monitored relatively easily.

DATA ANALYSIS

Quantification of a behaviour as complex as training is an exercise in simplification, which occurs at several stages. The most crucial simplification occurs when data are first recorded: if too much detail is sought, the athletes or the researcher will be overwhelmed; on the other hand, details lost at this stage may be important determinants of performance or health.

Further simplification occurs at the stage of data analysis, when variables representing the raw training data are combined into one or more global measures of training to permit modeling of relationships between training and performance or health. Statistics should also be simplified and presented with as little jargon as possible, especially if the audience is athletes, coaches, or other lay people.

Statistical analysis of training data poses several challenges. Variables representing training duration or volume are usually not normally distributed, so they need to be transformed if they are the outcome variables in an analysis. Log transformation usually works well and has the bonus that outcomes can be represented as per cent changes or per cent differences in training. Rank transformation (resulting in non-parametric analysis) is a second-best choice.

Training affects the health and fitness of the athlete through duration and intensity, but combining these two variables into a single global measure of training is fraught with difficulty. The

simplest and probably best approach is to multiply them together and add them up over all intensities. The resulting variable has the dimensions of work done or energy consumed in performing the exercise. It is sometimes known as a TRIMP (TRaining IMPulse). A problem with this variable is that training performed at a particular intensity for a particular duration produces the same TRIMP as training performed at twice the intensity for half the duration, yet training at the higher intensity usually has disproportionately greater effects on the body. Attempts to introduce a non-linear factor to make higher intensity training contribute more to the total TRIMP score should be avoided, because the value of the factor is arbitrary.

APPLICATIONS FOR MEASUREMENT OF TRAINING

The two groups of sports professionals who make use of methods to quantify training are practitioners (athletes and coaches) and scientists. For practitioners, the main applications are to motivate the athlete, make training systematic, and prescribe training. Sport scientists are interested in the relationships between training and performance, or between training and various aspects of the health of the athlete.

Use by Sports Practitioners

Motivation to adhere to training regimes is likely to be enhanced by any interest shown in the athlete's training, but the high-tech appeal of physiological monitoring and video recording probably succeeds more in this respect than other methods. Diaries appear to be the best way to promote systemisation of training behaviour, through their ability to produce a continuous record of training; the process of reviewing the training data in a diary should also stimulate a critical approach to the purpose of duration, intensity and skill components of specific workouts and to the purpose of the periodized structure in the training programme. Diaries are the most effective method for checking whether most aspects of a training prescription are being followed, provided the coach can be confident about the athlete's honesty or accuracy. Prescribed targets of training intensity for steady-state exercise can be set and checked with heart rate monitoring; lactate

monitoring has also been promoted for this purpose, but it is probably not reliable or practical enough for the coach or athlete. [The reviewer of this article noted the lack of convincing evidence that training at a specified target heart rate or lactate concentration results in better performance than less regimented training, for example of higher or more variable intensity.]

Use by Sport Scientists

The research interests of sport scientists fall into two groups: performance and health. The majority of researchers in both groups have used questionnaires as the main method of quantifying training, especially for descriptive studies. Experimental studies, in which the effects of an imposed change in training have been investigated, have been conducted mainly over short periods of time and have used mainly real-time observation to verify compliance with the training programme.

Past and present topics of interest in studies of training and performance have included the training behaviours of better performers, the effect of increasing the intensity of training, the effect of training or living at altitude on sea-level performance, and effect of a taper phase of training before a competition. Studies of the relationship between training and health of athletes have dealt with aspects of overtraining, injury, illness, wellness, immune function, psychological state, reproductive function and nutrition.

Chapter 12

Athletic Training and Sports Medicine

INTRODUCTION

The faculty in Athletic Training and Sports Medicine focus on research that relates to the delivery of clinical health services to physically active individuals including the pathoetiology, prevention, assessment, and treatment of common athletic and orthopaedic injuries.

Focus

Specific themes of research include: the mechanical and functional instabilities of joints, the role of proprioception and neuromuscular control in orthopaedic pathology, the development of functional assessment protocols for injured athletes, the control of pain and swelling after injury, skeletal muscle physiology and injury, clinical modalities, athletic training education, and sports injury epidemiology.

Collaborations

Graduate students become actively involved with research projects under the direction of faculty members. Collaborative arrangements exist with faculty and clinicians in other areas of the University including the Penn State Center for Sports Medicine, the Department of Orthopaedics and Rehabilitation, and

the Department of Intercollegiate Athletics. Didactic course work in athletic training and sports medicine is complemented by courses in biomechanics and locomotion studies, motor control, exercise physiology, and statistics and research design. Students applying for graduate studies in the Athletic Training and Sports Medicine area of Kinesiology need to be NATABOC certified.

Facilities

The Athletic Training Research Laboratory was founded in 1999 and serves as an area for data collection and analysis as well as graduate student offices. Equipment includes a wet lab space for biochemistry and histology, an electromyography and electrogoniometry system, a force plate, an isokinetic dynamometer, and other clinical assessment tools. A physical exam and treatment area, a functional testing area, and extensive computer equipment are also located in the lab.

The Athletic Training Education Laboratory serves as the location of clinically based undergraduate athletic training courses and contains educational resources such as physical examination and rehabilitation equipment, anatomical models and computer simulation programmes, and a gross cadaver lab. Extensive physical examination and treatment areas also complement this area and make it a frequent site of research activities.

Graduate students and faculty also have access to a wide variety of clinical populations and research equipment in other areas of the University such as the Penn State Center for Sports Medicine and the campus athletic training facilities.

Athletic training graduate assistantships are available for BOC certified athletic trainers who are eligible for an athletic training license in the Commonwealth of Pennsylvania. These assistantships are supported by the Department of Intercollegiate Athletics and interested applicants need to go through a two-stage application process:

1. First, students must apply for academic admission to the graduate programme in the Department of Kinesiology. Please see our Application and Admissions page for details on that process. Of note, our graduate programme is mentor-based so it is critical for applicants to identify

prospective mentors in their application materials (mentors do not have to be affiliated with the Athletic Training and Sports Medicine programme and can be from other programmes within the department). To facilitate that process, we have identified graduate faculty in different specialisations of the department who are (1) interested in mentoring students with more clinical interests and (2) will to accommodate the time demands imposed by clinical responsibilities for students with Athletic Training Graduate Assistantships.

SPORTS TRAINING IN THE PREPARATION OF A BOXER

As far as boxing is concerned it has also experienced many changes, and the most important ones are those applied to the rules in order to protect the boxer and, more specifically, to the subject in question: reducing the amount of rounds for world belts and for being in the 10 first boxers in world ranking. Initially, it descends from the round limitless fights and/or due to abandoning them until making 15 and then 12 rounds –mid 1980's- for world fights and 10 rounds for scoring in world rankings.

On this sense, reducing the amount of rounds is a factor that forces to achieve what was achieved before, only that in little time: the same or superior amount of punches, the increase of movements of the torso and of the movements around the ring; all being made in the same or less time unit (3 minutes per round or about 50 minutes per belt and near to 40 by scoring in world rankings). This reducing trend forced the introduction of changes in preparation systems at the same time, and more specifically, in the quasi- training as the structural unit of the entire preparation process of the boxer.

Given the fact that boxing presents its own problems concerning the adjustment of changes to new times and that also allows the solution of such problems, the author had as a basic objective the proposal of a new technical training approach for the boxer. This approach is based on the integral and systemic consideration of all kinds of preparation (physical, psychic, tactical and integral) with the meaningful predominance of the

development of each and every physical unit (strength, speed, resistance, flexibility and coordination).

SPORT TRAINING

Since sport training is a source and important part of sports preparation, it can also be considered as the structural unit of the entire preparation process. In other words, sports training is to the boxer's preparation process what the filament is to the muscle, or what the neuron is to the nerve system.

There are many definitions of sports training (ST); however, in this case we will consider it a specialized pedagogical process aimed to integrally educate and also to develop the motor qualities of the trainee; to assimilate and improve the technical and basic habits and to move the psychic and functional reserves of the athlete. All this will be achieved through the use of several physical exercises and/or motor actions that will have the adaptation of the organism to extreme or necessary efforts as an objective. It will also seek to reach the highest technical and sports results in the chosen sport.

Sports training can be observed and considered from many other points of view: As a source and important part of the periodicity of the preparation process, according to Matveev (1991) and Platonov (2004); to form microstructures (from 2 to 14 days), meso structures (from 15 days to 6 weeks) and macrostructures (from 7 weeks to 4 years). In other words, sport training is the key element to compose and generate preparation plans and/or programmes for the boxer or for any other sportsman.

As a preparation process that takes many years to complete, a process in which the athlete goes from one technical level to another, since he is a rookie until reaching and stabilizing high sports achievements. We do this from the moment in which the person is a rookie until reaching and keeping high sports achievements; the second one, divides such process into five (5) stages, predominantly pointing at cyclic sports (swimming, cycling, rowing, canoeing, and others); the third and last one, divides it into four (4) stages for the complex coordination disciplines concerning their structures or high technical skills.

These were divided in fewer stages, perhaps because of the fact that they were characterised as early specialisation sports.

In spite of the justified differences presented in the table, the fact that sports training is universally divided into stages and that it is a process that lasts many years unifies the criteria given by those specialists as a common denominator.

As a complex and dynamic system from a cybernetic position, meaning, from the theory of information (information exchange) as a functional closed circuit with its direct and reverse links.

From the cybernetic position, the training process is a complex and dynamic system (CDS) in which the role of system's director corresponds to the teacher- coach, and the role of being conducted goes to the athlete. Due to its nature, the direction of the CDS is the passing process from one stage to the other through the variable system's influences. In order to achieve this, the system director must count on a) the object's model (athlete) in his current status; b) the final model of the status that is necessary to reach (high sport scores); c) the model of the principles, the methods and ways of influence and changes that would be produced on the subject; d) the ways of reception and analysis of the results given by the preparation process (receiver and informative systems).

In this case, the direction of the ST is one of the most important premises that guarantee the keeping of the ideal structure and the making of programmes, plans and objectives of the problem. This direction is led by the teacher-coach with an active participation of the athlete and establishes three (3) operation groups:

1. Collecting information about the state of athletes including physical, technical- tactical and psychic preparation standards. The reaction of the different functional systems (nerve, cardio vascular, breathing, osteo-muscular, among others) to the competition and training loads.

2. The analysis of that information, by comparing the obtained parameters with the wanted parameters in order to correct, to plan and to achieve the goal.

3. Taking and making decisions by preparing and presenting objectives and tasks, plans, programmes, methods and ways to guarantee the achievement of the goal.

Kinds of Training

There are many and diverse kinds of training, therefore, naming them all is really difficult. Nevertheless, those could be classified in groups by considering their trends, according to the kind of preparation, the intensity or magnitude of the efforts and even the quality of training, among others. Some of these kinds will be shown next without untying their structures and contents; otherwise, not only would it be another topic, but it would also be extended and broad.

According to the kinds of Preparation, there are Several Kinds of Training:

Physical training can be general, special and complementary and at the same time, be subdivided into other kinds of training in order to develop force (static and dynamic, among others), speed (frequency of movement, time of movement, anticipation), power (with predominance of speed and force), resistance (aerobic, non-lactic and lactic acid, anaerobic resistance), flexibility (passive, active, elongation).

Flexibility (passive, active, elongation, joint mobility); coordinative quality (spatial orientation, still- dynamic balance, rhythm, precision, coordination of movement, differentiation of muscular efforts); Basic and/or special technical training that can be subdivided into other trainings for initial learning and notion creation, for a deep learning to assimilate the skill and for perfecting and stabilizing habit.

Tactical training of a basic and/or special kind is subdivided into trainings for the attack, defence, counter attack, persuasion and/or deceit, among others. Psychic training, that can be also subdivided into autogenous and ideomotion training, hypnosis and others

There are kinds of training that are voluminous and intensive, according to the magnitude of the efforts that are made. They can be subdivided into trainings of moderate, medium, maximal and sub maximal magnitude. With that magnitude trend, the kinds of training can also be determined for both sexes, masculine and feminine or for different ages (children, teenagers, youngsters, adult and mature people).

According to the quality of the training, which encloses all kinds of training, that quality can be also subdivided into excellent, good, satisfactory, average, bad, dangerous and fatal. Knowing these and other kinds of training along with their structures and contents is very important and fundamental for the teacher-coach because the quality of the entire preparation process and the achievement of high world class scoring results depend on that knowledge; just as the current boxing sport requires it.

COMPETITION PREPARATION OF ATHLETES

All athletes are nervous prior to competition, this is natural, but often it results in a lack of confidence by the athlete. The aim is to refocus the athlete so that they are positive and confident in their ability ("You only achieve what you believe").

The following competition stages focus on track and field athletes but in general, they can be applied to any event or sport.

DAY BEFORE COMPETITION

- Keep the training light and easy - work on technique
- Agree with you coach the objectives of the competition - outcome goal (what you would like to achieve *e.g.* win) and process goal (what you will technically have to focus on to achieve the outcome goal - *e.g.* drive the elbows)
- Check and pack all the equipment you will need for competition. Use an equipment checklist to ensure nothing is forgotten
- Organise food and drink required for the competition
- Check directions to the venue and plan to leave early so as to allow for any delay en route
- Have a high carbohydrate dinner
- Watch a video of good performers in your sport/event
- Get 7 or 8 hours sleep

MORNING OF COMPETITION

- Allow plenty of time between waking and leaving for the competition venue
- Carry out some light stretching before breakfast

- Conduct mental rehearsal of your warm up and competition
- Have a good healthy breakfast. Do not eat or drink anything that will upset your stomach
- Pack all the required equipment, food and drink
- Leave with plenty of time to reach the venue

PRE COMPETITION

- Once you arrive at the venue register and collect numbers
- Check event times and decide on when to commence your event preparation
- Fix numbers to club vest
- Avoid your competitors (speak to them after the event)
- Have a pre competition sports massage
- At the appropriate time conduct relaxation and mental rehearsal programme
- Carry out your practiced pre competition warm up programme
- Gather together any equipment you require for the competition
- Report at appropriate time to the collection point for your event
- Keep warm, relaxed and focus on your objectives for the competition

POST COMPETITION EVALUATION

- Congratulate your competitors
- Thank Officials
- Conduct your rehearsed cool down programme
- Get together with your coach to evaluate the performance. An evaluation form is useful to help the athlete and coach conduct this review

If you have more heats or events to compete in then refer back to the pre competition stage. After the final event:
- Have a post competition sports massage
- Gather equipment together and go home to celebrate

"What if"

On the day of competition and at the competition venue situations can arise that may cause the athlete to panic and lose

their confidence. Some situations can be created by the athlete (misplaced kit) others are outside their control (weather conditions). Prepare the athlete by going though a series of "what if" situations so should they arise they have a solution. The following are possible situations that may arise on the day of competition for a track and field athlete:

- You are stuck in traffic on the way to the venue
- The event time is brought forward
- The event is delayed
- You have entered the 200m and Long Jump and they are at the same time
- There are additional rounds in the competition (heats, semi and final)
- Not allowed to use your own starting blocks
- Starting blocks not allowed in the heats
- It starts raining
- It gets very sunny and hot
- Kit is forgotten, damaged or lost
- Lace has broken on your racing shoes
- You are not allowed to warm up on the track
- No safety pins provided to attach your number
- Lack of facilities to warm up

Talk it through with your athletes and find out what it is that worries them about competitions. Consider what can be done to reduce the chances of the situation arising or possible solutions should they arise.

THE IMPACT OF MENTAL PREPARATION ON ATHLETIC PERFORMANCE

Physical endurance and skill are two key factors that coaches, athletes and non-athletes attribute to outstanding athletes. When professionals, Olympians, and amateur athletes are thought of, their phenomenal physical shape is usually commented on. Rarely is an athlete's ability to perform attributed to their mental capacity to focus, which can allow them to overcome stress, anxiety, and the competition. At some point most athletes and spectators have probably heard "A game is played on a five and half inch court, the space between your head" and "A game is 10 per cent physical

and 90 per cent mental." If athletes and coaches, who preached these quotes, took them into consideration when practicing, they would recognise the impact of mental preparation on performance. Mental training during practice will allow for performances to be better indicators of the competitor's true athletic capacity; mental training would enable the athlete to perform better physically, mentally, and emotionally.

At press conferences following disappointing performances coaches, captains, and athletes usually attribute loosing to non-physical factors. Athletes never say, "I didn't feel like running" or "I didn't feel as strong today as I have other days." Instead, they say "We couldn't seem to concentrate", "We weren't mentally ready", or "Our opponents wanted it more." Even though they say this, coaches rarely act on these comments. Coaches will work athletes/competitors harder on the physical endurance and intricate skills required to be successful in competition. They rarely take the time to focus on mental breakdown because they don't feel that it is a contributing factor to a decline in play. Coaches are not teaching or training their athletes to be mentally prepared for the stresses and anxieties that impact motivational level and overall performance. Too often, coaches fail to recognise that it is more important to focus on the psychological/mental aspect of the game, especially since physical abilities remain relatively stable and psychological factors are more likely to account for fluctuations in performance.

Many coaches and spectators have the misconception that champions are born rather than made. They think that athletes such as Steffi Graff, Wayne Gretzky, and Bill Russell were born with superior mental and physical capacities. Contrary to this thought, all athletes will acknowledge the countless hours they spent on developing both physical and mental skills.

In an interview, Bill Russell stated that his "ability to physically and mentally intimidate his opponent and maintain his coolness and concentration despite distractions are a result of countless hours of integrating psychological and physical skill." Still despite what even the most accomplished athletes say in regards to the importance of mental training, evidence shows an overwhelming majority of coaches are not applying any type of

psychological sport training. From the athletes' standpoint, not knowing how to focus on the mental aspect of the game causes increases in stress and anxiety, decreased motivation, and poor play. Multiple theories and tactics on mental training work to provide the focus necessary for outstanding performances, coaches just need to find time to teach mental training skills and observe the results.

Research conducted in the 60's and 70's yielded inconclusive outcomes as to the relevance of mental practice, but overall concluded that mental practice facilitated motor performance in about fifty per cent of the studies. This evidence was not enough o say that there was a strong relationship between performance and mental practice, but it did indicate that there was a correlation that should be further looked into. In building upon previous research, in 1983 Fletz and Landers conducted a meta-analysis termed "The Effects of Mental Practice" of sixty previously conducted studies. In this study, the term mental training was broadly redefined to include techniques such as modeling, audiovisual instructions, visual imagery, relaxation, and psyching-up strategies. Scores on these various forms of mental practice were compared to the score of a control group who received no mental training when performing physical task. Fletz and Landers concluded that mental practice has relatively low to average effects on performance but is "somewhat better than no practice at all." An update of this study in 1988 done by Fletz, Landers and Becker further concluded that the type of task moderates the relationship between mental practice and performance. They found that the more complex and important the physical task is, the greater the effect mental practice has performance.

In 1996 Hallgeir Halvari examined the effects of mental practice on performance and further expanded upon the findings of Fletz, Landers and Becker. Using the Sport Competition Anxiety Test, he measured cognitive anxiety in forty-five subjects who were divided up into 2 groups: a mental practice group, and a control group. Both groups were required to perform specified exercises correctly and in a specific order. The specific exercise combination required more mental capacity than physical ability to be performed well.

The mental practice group was instructed to rehearse mentally the exercises without physical movement two days before, one day before, and 30 minutes before the test. The control group was instructed to prepare physically to perform the specified exercises. Halvari compared how the two groups scored on the Sport Competition Anxiety Test and found the mental practice group scored lower on the anxiety test and performed the task with few performance errors. The control group scored higher on the anxiety test and performed the task poorly in comparison to the mental practice group. Halvari concluded that a lack of mental preparation might result in poor performance of a specific task. He showed that poor performance is related to anxiety, which increases the number of performance errors committed during a task.

In athletic competition, poor performance is frustrating for coaches, athletes and spectators, however, to account for a lack of performance coach's focus on physical skills instead of mental skills. Although the lack of mental preparation can be a contributing factor to the problem, coaches doubt its relevance because of their concerns about the time it takes to adapt to the idea of mental practice before it actually proves beneficial and because athletes may initially have trouble shifting their attention from irrelevant to relevant focusing cues. Also, specific game situations require more instruction and mental focusing than others. In these cases, it is not easy to recognise and focus on the situation when it may be over with in a matter of seconds. With the growing awareness of the value of mental preparation and the challenge of effectively teaching it, psychologists have devised a variety of ideas on how to prepare athletes for optimal performance during competition.

Psychologists began studying sports in the nineteen thirties and forties. At this time, their focus was not on sports alone, but also on motor performance and the acquisition of motor skills to master difficult skills under intense physical stress and social pressure.

However, in the nineteen sixties sport psychology began to form a niche in the world of psychology. The theories of social psychology and how athletes respond to the stresses and pressures of their audience, competitors, and coaches dominated the niche.

At the present time, sport psychology still remains based on the philosophies and matters such as personality traits, motivation, and social influence that were developed in the early 1930's. Still, the field has further molded itself into the scientific study of an athlete's behaviour and cognitive reactions to sport settings. The field of sport psychology is of interest to coaches and athletes because it seeks to explain why athletes perform better under different conditions, how to enhance athletic performance, and how coaches can facilitate optimal conditions for athletes both mentally and physically.

Psychologists classify sports settings as settings in which activities involve power, skills, competition, strategy, and chance. From these sport settings, enjoyment, satisfaction and personal gains can be achieved. Nowadays, athletes at all levels come in a variety of shapes, sizes, and capabilities, but generally athletes are those individuals who partake in activities classified under the term sport setting.

An athlete is an individual who participates in a sport at a recreational, intramural, or intercollegiate level, wins awards for a sporting event, and is trained to exercise physical agility and strength. At all levels athletes exhibit traits of extroversion, dominance, self-confidence, competitiveness, low anxiety, low compulsiveness, and tolerance for pain. These traits and the athlete's self concept, or set of beliefs concerning his or her appearance, ability, potential, limitations and sense of worthiness, play a large role in his or her performance. Regardless of the ability of the athlete, the traits which the athlete portrays, or even the specific sport, coaches generally rely on some form of sport psychology to aid them in preparing their athletes for both the physical and mental game.

All coaches have their own style or philosophies on how to prepare their athletes for the pressures, stresses, and physical and mental demands that they will be facing in competition. These philosophies are generally representative of the coach's own behaviour and his/her expectations of the athlete or team. Those coaches, who find it difficult to display the behaviours and expectations that they demand of their athletes, often struggle in gaining the authority and respect that is necessary for the

successful training of a team or individual. Such coaches that do not set realistic goals have trouble constructively critiquing performances, and lack the respect of their players, parents, and fans.

An ideal coach will not only demonstrate the behaviours and expectations that they demand of their athletes, but they will also be aware of and exhibit qualities such as intelligence, realism and practicality, confidence, self-sufficiency. An ideal coach will recognise that the success of the team depends on the knowledge and wisdom that he/she brings to the team and sport. Coaches who can exhibit such qualities will be successful because they can play several roles in various situations.

They can use their positive psychological qualities to motivate their athletes and train them for both physical and mental competition. These coaches will have their needs meet, help their athletes feel secure when faced with stressful circumstances, experience less aggression, and will be successful in training their athletes physically and mentally. A coach's poor emotional and mental control may lead athletes to loose respect for that coach, and may heighten the anxiety level of athletes and observers about the task at hand.

In addition to gaining respect of their players, motivating and physically preparing their athletes for competition, coaches must require mental training in their team's daily practice regime. In physically preparing athletes for competition, a coach may choose to have their team perform conditioning exercises, drills which include perfect execution of a variety of skills, and scrimmages or competition simulations. Aside from all the benefits of physical practice, it is not enough to solely train and condition athletes. If athletes do not know how to mentally focus during competition, they become incapable of executing their physical skills to their ability. For most athletes, mental focus is the result of mental practice. With enough practice, focus becomes second nature even in a stressful situation.

To achieve mastery of mental skills, athletes must pay attention to areas such as attention, mood, anxiety and stress. Through focusing on these areas, mental practice is engaged in by the athletes. Mental practice is cognitive rehearsal in the

absence of physical practice. Sport Psychologist B. S. Rushall has described three main strategies to mental training. These are segmenting, thinking practice, and competition strategies. Segmenting is breaking plays into step-by-step actions so that each step is short enough that the athlete can concentrate on what needs to be done.

Allowing athletes to focus on the successful completion of an element that is critical in competition. A thinking practice or mental practice allows athletes to develop the skills necessary to think clearly during physical activity. During the initial stages of thinking practice, a concentrated effort on the part of the athlete is necessary when imagining the performing of skills. Eventually, this athlete will transfer the skills thinking practice to the playing field, and remain in mental control using minimal effort to concentrate.

Competition strategies are the combinations of segmenting and thinking practices; they are the content of what the athlete is thinking during a contest. With the correct training and practice on how to break plays down, how to react to actions of the competitor, and how to handle advice of coaches in stressful situations, competition strategies have proven successful.

Unfortunately, many coaches do not practice mental preparation because they do not realise impact that mental capacity may have on an athlete's performance. Many coaches believe that increasing physical practice time and working harder on shortcomings can rectify a performance breakdown. Such coaches believe the mental skills responsible for the loss will take care of themselves.

What these individuals do not understand is that fluctuations in skill and performance are a combination of both physical and mental skills. Successful athletes who incorporate mental skill practice into their physical training exhibit controlled mental capabilities during performance, emotional stability, low trait anxiety, and high psychic vigour. Likewise, findings from research involving the Mental Health Model indicate that intense physical training alone routinely results in mood disturbances and decreased performance in athletes who otherwise exhibit positive mental health profiles off-season or during periods of easy training.

Mental skills serve not only to focus athletes on the internal anxiety and stress accompanying game situations, such as a racing heart rate, butterflies in the stomach and an increased rate of breathing, but also to help them focus when external stressors play into their anxiety level.

Stressors outside of the athlete's control include refereeing decisions, tournament organisations, coach and teammate influences, and social support. Both internal and external stress can play into the overall performance of an athlete in similar ways. These stresses may cause misjudgements, over reactions to plays, and missed signals or cues. All of these stresses arise whenever the athlete's physical requirement is either overloaded or fails to adjust to the necessary energy demands, and the level of arousal or excitement is off.

Qualitative studies have alluded to internal and external stressors as important determinants on performance. However they suggest that further research into these stressors and the levels at which they become influential in performance would provide further knowledge to enhance the mental preparation of sports performers in such situations.

What sport psychologists do know is that both external and internal stress plays a role in peoples' cognitive abilities and impedes overall performance.

Halvari has found that a strong mental anxiety negatively affects self-regulatory abilities related to optimal use of energy during performance. Having too much energy exerted in a short period of time may lead to both physiological problems in completion of endurance tasks and increase the chances of error in the performance of complicated tasks.

The impact of mental training on stress, anxiety, arousal, and energy modification during performance may often be the difference between winning and loosing a game. When the athletes in competition are of similar ability, and the perceived importance of the event is elevated, athletes experience higher levels of pressure.

However, even in the worst of conditions and circumstances, athletes who are mentally focused on the game will perform better in the end.

SPORTS MEDICINE

LOADING

Epidemiological data have shown that tennis injuries are primarily caused by overuse. Loading (the rate of force development, peak force, and torque are mechanical factors that collectively are often referred to as "load") may be applied to the body externally (ground reaction force, vibration) or internally (muscle forces and torques). Research on elite players at the Sydney Olympics provided an insight into the load placed on the shoulder and the elbow joint of these players. These data provided information on leg drive, the abbreviated backswing, and service speed as they affected shoulder and elbow loading. In very general terms, this chapter showed the following.

- Loading increased with an increase in service speed. That is, irrespective of sex, if a player wishes to develop a more powerful serve they need to modify technique (rotate selected segments more quickly) and prepare the body physically to perform the higher speed movement(s).
- Those players with more effective knee flexion extension during the service action were associated with lower loading at the shoulder and elbow. This finding needs to be further clarified such that the effect of leg drive on loading is assessed; this is currently taking place at the University of Western Australia.
- There was a trend for players with very abbreviated backswings to record higher force levels at the shoulder. This finding is also currently being tested in a more controlled design.

Staying on the topic of loading and the tennis serve, Chow *et al* investigated activation on the lower trunk muscles during various types of service actions. They showed that co activation of lower trunk muscles assists in the stabilisation of the lumbar spine during extension/flexion and rotation of this region during the service action. The abdominal muscles were more active in the topspin serve than the flat and slice serves during the upward swing of the racquet to impact. These results reinforced the importance of abdominal and low back exercises (core stability)

together with the muscles about the shoulder and lower limbs in strength and rehabilitation programmes in tennis.

TENNIS ELBOW

The prevalence of lateral humeral epicondylitis is acknowledged as a condition that primarily occurs in the recreational athlete. Research on the one handed backhand stroke shows that this condition may be related to the use of faulty stroke mechanics by novice players. Skilled players impact the ball with a hyper extended wrist and extend the hand through impact. That is the extensor muscles about the wrist joint act concentrically to develop racquet speed through impact. However, novice players often strike the ball with the wrist flexed (~13°), while moving the hand at the wrist joint into further flexion. That is the extensor muscles about the wrist joint contract eccentrically, before the contraction concentrically following impact. Wrist extensor electromyography for both groups showed similar levels of activity in the period before ball impact, whereas the skilled players showed greater electromyographic levels after contact.

The above study was followed by another with a similar design but with professionals and intermediate level players with and without a history of tennis elbow. Hand angular velocity at the wrist, measured by an electrogoniometer, was significantly different in the professionals (4 rad/s, extension) and intermediate group who had a history of tennis elbow (0.4 rad/s, flexion). As with the study by Blackwell and Cole,lateral epicondylitis has been associated with an eccentric contraction of the wrist extensors at impact. No significant differences were found in impact acceleration or elbow kinematics between the three groups.

MUSCLE BALANCE

One of the possible causes of shoulder injury may be peak strength/torque imbalances in those muscles responsible for acceleration and then deceleration of the upper arm at the shoulder joint. Certainly work by Tod Ellenbecker and Paul Roetert has provided players, coaches, and sports medicine personnel with isokinetic profiles of highly skilled and junior tennis players. The comparison of the concentric strength of one muscle group

compared with the eccentric strength of the antagonist group in throwers was explored by Noffal. He concluded that rehabilitation and injury prevention regimens that include exercises for eccentric external rotation strength may bring more balance to the dominant shoulder of throwing athletes. Such information is critical to the preparation of athletes where explosive concentric and eccentric contractions are common place. Remember, in most tennis strokes, the stretch shorten cycle is characterised by eccentric followed by concentric contractions. For example in the serve you have:

- External upper arm rotation at the shoulder during the backswing slowed by eccentric contraction of the internal rotators at the shoulder.
- Concentric contraction of the shoulder internal rotators, in the drive to the ball, is then slowed by an eccentric contraction of the shoulder external rotators during the follow through.

It is therefore apparent that we must train muscles in concentric and eccentric modes, while also recognising that large muscle imbalances will lead to injury. This is particularly true in the eccentric contraction during the follow through, as the external rotators at the shoulder are required to "decelerate" the rapidly internally rotating upper arm. Prehabiliation or exercises to minimise loading stresses should be included in any training programme before a return to full training.

Conclusions

There is no question that players striving for more power, more control, or more variety in stroke production through trial and error are the primary determinants in changes to stroke mechanics. However, I have shown that biomechanics certainly plays a role in the process of change. General theory provides a base on which modifications can be made, and an understanding of individual stroke mechanics inevitably leads to improved performance. Science also enables players to modify their training regimens with minimal risk of injury. I have no doubt that the other sports science disciplines (psychology, exercise physiology, and pedagogy/motor learning) could also make a case for their role in player development.

Areas where science can play an improved role are in the linking of growth and development of the body, pedagogy, and skill development. When should selected biomechanical principles be introduced? When should we teach the leg drive in the service action from skill development and lower limb strength perspectives? From a tissue loading perspective, should we stress the importance of energy storage and muscle pre tension at an early age? Although sport science has certainly assisted tennis development, it is also important to realise that much is still to be accomplished.

Chapter 13

The Use of Technology Training in Sports Biomechanics

THE IMPORTANCE OF PROPER BIOMECHANICS

In sport and exercise, biomechanics refers to the study of human movements, including the interaction between the athlete, sport equipment and the exercise environment. Athletes are always trying to find ways to get faster, higher and stronger with minimal injuries. Improving your biomechanics may be one important way of enhancing your athletic performance, minimizing injuries and in turn, promoting career longevity.

In the example of baseball, understanding the proper biomechanics of pitching is one of the critical factors in establishing whether a pitcher is major or minor league material. Of course, there are other parameters used to measure a person's ability to pitch in the majors, but having proper form and good technique helps. Having a potent fastball, a deceptive change up and a wicked curveball must be learned - therefore, developing the right mechanics early on to deliver these pitches makes a big difference. A pitcher must also consider his health relative to his chosen art. Throwing a 160km fastball is an incredible feat, but one that is very hard on your body over time.

Learning proper mechanics to throw a fastball, beginning with the wind-up stage and culminating with the follow through stage, is crucial to staying injury free.

In addition, developing effective secondary and tertiary pitches can minimize the beating your body takes by diversifying your pitching repertoire, and keeping the fastball pitch counts down. For young pitchers, mastering the proper biomechanics of body movement can go a long way in minimizing the chances of getting injured. The less injury prone a pitcher is, the greater the chances of developing into a major leaguer. In the case of running, having the proper biomechanics can help improve your running economy by making the runner more efficient since they are using less energy. It also helps minimize imbalances and overuse injuries. The less time you spend on the sideline and more on training and competing the better chances of developing long-term.

BENEFITS OF PROPER BIOMECHANICS

- Develops efficient movement patterns whether on the field of play or during resistance training.
- Improves sport-specific technique and form to enhance performance and minimize injury.
- Develops proper habits, ensuring that the athlete is able to develop in the long term.

Understanding proper sport and exercise movements will allow the participant to be more efficient, technically sound and prone to good habits for long-term development. An athlete who incorporates proper biomechanics ensures that he or she minimizes the risk of becoming injured, enabling them to pursue their potential to its highest level.

THE USE OF TECHNOLOGY IN SPORTS BIOMECHANICS

Just as technology has altered so many fields of science, it has touched biomechanics in sports. Biomechanists use computer model simulations to perform research.

They use advanced measurement tools to collect data for study. Scientists can use technology to simulate certain conditions or force more resistance on human movement. This has all enhanced how important biomechanics in sports are, and increased funding.

TODAY'S APPLIC**ATION OF SPOR**TS BIOMECHANICS

One of the biggest areas where biomechanics in sports is used is among Olympic teams and committees. Because the Olympics only take place every four years, the teams place a massive emphasis on finding the best training techniques. Team USA's headquarters has countless labs and gyms where the cutting edge of the field is being implemented. Many of the researchers in the countries various biomechanics labs contribute new research to help Team USA succeed.

Biomechanics in sports isn't just limited to countries or teams, athletic apparel companies like Nike and Adidas are also on the cutting edge of biomechanics research. Their product developers are constantly looking for new technology that will make their product superior.

The science may at times take a back seat to style, but the importance of biomechanics to these sports companies is by no means miniscule.

THE INTERNATIONAL SOCIETY OF BIOMECHANICS IN SPORTS (ISBS)

The ISBS is dedicated to the advancement of biomechanics in sports. Founded in 1982, the ISBS has been committed to organising scientists in the field and recognising great advancement and achievement.

Their annual conference has become a great symposium where the most important research in the field is unveiled. Some relevant research from last year's conference in Taipei included research into better bras, the rugby scrum, and the evolution of athletic footwear.

They also regularly publish an official journal in the field of biomechanics in sports.

The field of biomechanics in sports is only growing as time passes. As the business of sports continues to grow, so will the money dedicated to improving it. Some important biomechanics research being done today involves hot button issues in sports like concussions and head trauma. There is no doubt that sports biomechanics will only become more relevant in the coming future.

BIOMECHANICS FOR FUNCTIONAL TRAINING, SPORTS PERFORMANCE, STRENGTH AND CONDITIONING

WHAT IS BIOMECHANICS?

In scientific terms, mechanics is the science of matter and forces and their effects on movement and equilibrium. Biomechanics is how this is applied to the body. It is often divided into 2 sections:

Static; which is concerned with the body in balance;

Dynamic; which is concerned with the body in motion.

The human body and how it moves in mechanical terms can be divided into two areas of study: 'extrinsic' and 'intrinsic' biomechanics.

Extrinsic Biomechanics looks at movements and the measurement of those movements, then establishes the most efficient way to perform them. It is an important science that is relevant to any sport, fitness or physical conditioning programme.

Intrinsic Biomechanics, on the other hand, is the study of how the body is able to perform those tasks or movements in relation to the individual's mechanical make-up.

Example

Take sitting at a computer using a computer mouse and keyboard as an example. Have you ever noticed that during the day (or the period of time that you are on the computer) that your shoulders slowly elevate?

This 'mousing' and keyboard activity can cause tension in the trapezius muscle and can result in discomfort if you are a regular computer user. Conventional wisdom says you should periodically lower your shoulders, you should have them massaged and you should look at your desk ergonomics.These are extrinsic biomechanical interventions that can help, but unless you understand the cause of the shoulders elevating, any strategies to resolve the problem will be ineffective in the long term, even if they do help in the short term.

Fig. Median Nerve Test.

One common intrinsic biomechanical cause is tension in the median nerve. This is a nerve that runs from your neck, down your arm into your fingers. When you perform repetitive movements nerves become 'tensioned', in other words they get stiff, and the muscles that would take the tension off the nerve (if they were to contract), then go into spasm to minimize the tension. In this example the trapezius muscle takes the tension off the median nerve by elevating the shoulder. So if the shoulder needs to elevate to take the tension off the nerve and you are being told to press your shoulder down, this can actually increase the tension on the nerve and at best hinder progress, or at worse can cause further problems.

The take home message here is to make sure that the intrinsic biomechanics are dealt with before any extrinsic strategy is adopted. So how does this apply to Functional Training, Sports Performance, Strength and Conditioning, Injury Prevention, Rehabilitation and Injury Management?

FUNCTIONAL TRAINING AND SPORTS PERFORMANCE

Functional training is the latest trend in fitness at the moment. It works on the premise that the body is designed to work by

performing patterns of movement which engages muscles in natural way rather than in one plane of movement. So, for example, a functional pattern would be throwing or squatting which works many groups of muscles, rather than arm curls (where you bend the arm holding a weight), which works one group. But what prepares you for functional training? Think about a squat movement, which involves your ankle, knee and hip. You can have problems with any of those joints (and others) and sometimes the movement will be compromised: sometimes the knee bows inwards, weight goes through more one side than the other, your body bends forwards too far or any number of different mal-alignments. Sometimes though the body compensates for problems with one body part, in fact it is quite adept at doing so, and in these cases you cannot see any abnormality in the movement pattern.

So there is a risk in relying solely on this form of exercise and screening.

Understanding how each of the body's joints or systems works independently is essential to see whether that section has the capacity to function as part of the whole. Remember this phrase; if it isn't functioning it can't be functional. A biomechanical screen will provide this information and is used as a precursor to functional screening and training.

Once each joint or system has the capacity to function correctly, functional training using combinations of joints and systems, then becomes more likely and the movements are pure not compensatory.

The take home message here is make sure you have your biomechanics checked out before you decide which type of training you are going to perform; whether it be functional training, sports performance or even bodybuilding.

BIOMECHANICS AND SPORTS PERFORMANCE

The performance of a sport is affected by many different factors. Your biomechanical function has a profound effect on how your movement patterns are controlled and compensated for during the performance of a movement or series of movements. It is often these compensations for biomechanical issues that lead to faulty

movement patterns and ultimately compromised sports performance.

For example, if a golfer had an overactive infraspinatus muscle (one of the rotator cuff muscles) in the shoulder, it could significantly affect their ability to deliver a consistent swing. As the club moves through the swing, building up speed from the top of the backswing towards impact, the capacity of the left infraspinatus to stabilize the left shoulder and contribute towards external rotation of that shoulder is critical when delivering a consistent club position to the back of the ball. Simultaneously although the right infraspinatus is relatively inactive during the downswing (apart from some stability work), it needs to work very hard eccentrically to slow the shoulder down after impact.

It is extremely difficult to establish an overactive infraspinatus muscle using functional screening or indeed medical screening, but it takes 10 seconds in a biomechanical screen and is evidenced as being reliable and accurate. The same principle applies to all arm related events, including javelin throwing and tennis, so the take home message here is get biomechanically screened as you are increasing the risk of injury and compromised performance without one.

Biomechanics and Injury Prevention

There are many causes of injury ranging from poor technique, poor 'core' strength, poor preparation, insufficient range of movement in the relevant structures and many others. Your correct biomechanical function is also a critical factor, but is generally less understood. A biomechanical screen will highlight the flaws in your pelvic, shoulder and knee function, as well as check whether you have any low grade muscle spasm in key muscles, which may be restricting both movement and the correct functioning of a joint. In addition a biomechanical screen will check your nervous system and highlight any problems that may cause your body to compensate and break down.

For example, a rotated pelvis is something that many of us have, but are not aware of. One of the results of this is what's known as a functional leg length discrepancy. As the pelvis rotates forwards, the level of the ilium (pelvic bone) on that side can drop

lower compared to the opposite side and make that leg appear longer. This can result in a variety of different injuries depending upon how you compensate; it can cause lower back pain, knee pain, shin pain, hamstring injuries, even foot pain. Some people have been known to have upper back and shoulder problems from this too. By screening issues like pelvic rotation, the risk of many of these injuries can be significantly reduced. The solution is to perform tests to see whether the pelvis is working biomechanically correct. Once established there are a variety of corrective exercises that can be performed to re-align the pelvis and encourage it to function correctly again.

Strength and Conditioning

Strength and Conditioning (S&C) has had something of a renaissance in the fitness industry in recent years following the great work by the UK Strength and Conditioning Association. The scientific principles in S&C are generally evidence based and anyone who prescribes exercises for any reason should learn and apply them. Clearly biomechanics plays a critical part in this type of training too. Irrespective of the type of training you perform, you need to be biomechanically prepared, otherwise that training can cause injury or at least compromise your performance.

Example

Bench pressing is one of the oldest exercises in strength and power training, yet there is some debate around the technique; in fact in some circles, the actual value of the exercise is being questioned. The question here is; how far down should the bar be taken to the chest and how does an understanding of biomechanics help you recognise the answer? This cannot be answered without asking a further question: for what purpose are you bench pressing? The reason the bar has been typically taught to be taken to the chest is because in competitive powerlifting the rules say so. There has to be a standard point that can easily be identified by the judges. So in this context it is correct to take the bar down to the chest. In other circumstances, it may not be.

Outside of the competitive arena, the easiest way to find how far down the bar should go for your shoulders is to take a light

broom stick and use it to bench press. As the bar lowers you will rotate more-or-less around the axis in the shoulder joints. This is efficient and minimizes the load on the shoulders. When you get to the natural end of your shoulder ranges of movement, the axis will change from the shoulder joints to the shoulder girdle. When this happens, the type of movement changes from rotation around the shoulder joint to a retraction of the shoulder girdles, in other words they move together and the width of the shoulders actually reduces.

This alters the plane of movement and mechanics to the point that at the bottom, when the shoulders are retracted; the return movement means you are pushing out to the side more than you are pushing straight up. Given that the bar is forcing the humerus down and the muscle contraction is working at an inefficient angle to the line of gravity (pushing out to the side), this makes for an awkward position and ineffective movement that can cause impingent.

So, the take home message here is to bench to the depth that your shoulder joint ranges allow, without letting your shoulder blades glide towards each other, unless of course you are a competitive power lifter in which case you'd better hope there are some rule changes!

So if you have biomechanical problems with your shoulders or upper back (thoracic spine), then the loading through your shoulders while bench pressing can be high enough to cause injury; combine this with a poor technique the risk is even higher. Understanding the biomechanics of the movement will help with your technique and reduce the risk of injury during the exercise.

Rehab and Injury Management

Therapists are becoming increasingly skilled at being able to diagnose and treat injury. One factor that is now recognised to compliment that process is the understanding of biomechanics. The kinetic chain and how structures relate to each other in biomechanical terms can have a profound effect on outcomes. Understanding that the shoulder can be a biomechanical cause of pelvic and low back injuries for example (and vice versa) is a major step forwards in the management of injuries. Recognizing

how to measure this and make evidence based decisions based upon those outcomes is another. As biomechanics is increasingly used in the treatment of musculo-skeletal injuries, they are getting better quicker and the risk of recurrence is less.

For example, a player with 'non-specific' groin pain which was failed to be diagnosed despite specialist consultation and MRI scanning was treated successfully by working on the biomechanical function of his opposite shoulder. The body is an integrated system and all of its component parts affect each other to some degree. The key here is to ensure that the injury is being treated correctly of course, but running along-side this, a system of biomechanical screening can identify and eradicate any biomechanical causes of that injury to reduce the load on the injured structure.

TECHNIQUE: BASIC TERMS AND PRINCIPLES IN BIOMECHANICS

Biomechanics is the study of the causes of human motion, so tennis biomechanics is essentially the science/ mechanics tennis technique. When tennis coaches combine their practical tennis teaching experience with knowledge of tennis biomechanics, they can accurately analyse strokes, prescribe training and exercises, and maximize skill development while minimizing the risk of injury to their players.

Knowing the how and why of tennis motions is essential to prescribing the best possible tennis instruction. It is important to know several biomechanical terms and principles to better understand tennis technique:

- Forces and torques,
- Newton's Laws of Motion,
- Linear and angular momentum,
- Center of gravity,
- Kinetic link/ Kinetic chain.

FORCES AND TORQUES

A force is simply a push or pull and it changes the motion of a body segment or the racket. Motion is created and modified by the actions of forces (mostly muscle forces, but also by external

forces from the environment). When Force rotates a body segment or the racket, this effect is called a torque or moment of force.

Example— Muscles create a torque to rotate the body segments in all tennis strokes. In the service action internal roation of the upper arm, so important to the power of the serve, is the result of an internal rotation torque at the shoulder joint caused by muscle actions (latissimus dorsi and parts of the pectoralis major and deltoid).

To rotate a segment with more power a player would generally apply more muscle force.

Newton's Laws of Motion

Newton's three laws of motion explain how forces create motion in tennis. These laws are usually referred to as the laws of inertia, acceleration, and reaction.

- *Law of Inertia:* Newton's first law of inertia states that objects tend to resist changes in their state of motion. An object in motion will tend to stay in motion and an object at rest will tend to stay at rest unless acted upon by a force.
  Example—The body of a player quickly moving across the court will tend to want to retain that motion unless muscular forces can overcome this inertia. Players should therefore build movement into their basic stroke production that takes them back towards the center of the "hitting-arc".

- *Law of Acceleration:* Newton's second law precisely explains how much motion a force creates. The acceleration (tendency of an object to change speed or direction) an object experiences is proportional to the size of the force and inversely proportional to the object's mass *(F = ma).*
  Example—If a player improves leg strength through training while maintaining the same body mass, she or he will have an increased ability to accelerate the body using the legs, resulting in better agility and court speed. This also relates to the ability to rotate segments.

- *Law of Reaction:* The third law states that for every action

(force) there is an equal and opposite reaction force. This means that forces do not act alone, but occur in equal and opposite pairs between interacting bodies.

Example—The force created by the legs "pushing" against the ground results in ground reaction forces in which the ground "pushes back" and allows the player to move across the court (As the Earth is much more massive than the player, the player accelerates and moves rapidly, while the Earth does not really accelerate or move at all). This action-reaction also occurs at impact with the ball as the force applied to the ball is matched with an equal and opposite force applied to the racket/body.

Momentum

Newton' second law is also related to the variable momentum, which is the product of an object's velocity and mass. Momentum is essentially the quantity of motion an object possesses. Momentum can be transferred from one object to another. For tennis coaching, you need to know two types of momentum:

- *Linear momentum*, which is momentum in a straight line. *Example*— Linear momentum is created by the forward step in a square stance forehand.
- *Angular momentum*, which is rotational momentum and is created by the rotations of the various body segments. *Example*—The open stance forehand uses significant angular momentum. The tremendous increase in the use of angular momentum in groundstrokes and serves has had a significant impact on the game of tennis. One of the main reasons for the increase in power of the game today is the incorporation of angular momentum into groundstroke and serve techniques.

In tennis, the angular momentum developed by the coordinated action of body segments transfers to the linear momentum of the racket at impact

CENTER OF GRAVITY AND BALANCE

Understanding the concepts of the center of gravity and balance is enormously important if you are to coach tennis

successfully. These concepts are interrelated and have a profound effect on the success or failure of stroke production. Loss of balance or poor balance is one of the single biggest causes of errors in tennis.

Center of Gravity

The center of gravity is an imaginary point around which body weight is evenly distributed The center of gravity of the human body can change considerably because the segments of the body can move their masses with joint rotations. This concept is critical to understanding balance and stability and how gravity affects tennis techniques.

The center of gravity of a tennis racket is a far simpler process and can usually be found by identifying the point where the racket balances on your finger or another narrow object.

Balance

Balance is the ability of a player to control her or his equilibrium or stability. As a coach, you need to know and understand two types of balance:

- *Static balance:* The ability to control the body while the body is stationary.
  Example—A player uses static balance when she or he prepares for a serve.
- *Dynamic balance:* The ability to control the body during motion.
  Example—A player uses dynamic balance when she or he changes direction after hitting a shot.

PERFORMANCE OF SPORTS TECHNIQUE

Sports technique can have a large effect on performance. The technique of rowing has a great influence on the actual performance; therefore, much time is spent on improving the motor skills of rowers. The traditional method of training motor skills in rowing was a coach giving verbal cues during the rowing exercises. Lately motor skills are also trained by giving visual feedback through video images of expert rowers or images of the subject. Often the coach gives some verbal cues with the

images. Recently a new feedback technique has been used by New Zealand rowing coaches - the AUT Goggles Training System (GTS). The GTS consists of real-time video images projected on Sony Glasstron goggles from a telemetered video camera held by the coach. By using the GTS rowers can see themselves in action and receive some verbal feedback given by the coach through a communication system.

Together with the 'traditional' motor skill training methods this type of training can hopefully contribute in the understanding of motor skills of a rower and subsequently performance will increase. Improved motor skills are believed to increase performance because of greater efficiency and a reduction of injuries through more controlled motor skills. The first step in this theory is to investigate whether visual and verbal cues really affect motor skill improvement and in what way motor skills can be measured and presented.

METHODS

The following questions were asked:
- What methods are currently used for technique feedback in sports?
- What biomechanics feedback techniques are used in rowing?
- What evidence is there that feedback methods actually improve performance?
- How effective are coaching methods?
- Can too much feedback be confusing for the athletes?

Thirteen original research articles, six review articles, one book chapter, and three masters theses were reviewed. The articles were located by searching Medline, SportsDiscus, Current Contents, Cihal, ABI/INFORM Global and ProQuest Direct databases and the internet.

Findings

What methods are currently used for technique feedback in sports?

Coaches use in most cases verbal cues to give their athletes direct feedback. In many cases verbal feedback is backed up by

indirect visual feedback - images of training or competition are shown to the athletes afterwards. Verbal feedback by an expert can be added to the images when systems such as siliconCOACH® are used.

What Biomechanics Feedback Techniques are used in Rowing?

Since 2000, the Rowing New Zealand coaches and biomechanists have been using a method of presenting segmental interaction of the rowing stroke - the rowing segmental sequencing graph. This graph, which presents the timing of the body and oar actions, is used in conjunction with slow motion video clips of the rowing technique. Improvements in the segmental sequencing have occurred during the two years of using this monitoring device at national training camps.

The effectiveness of visual feedback through the AUT Goggles Training System (GTS) in changing ergometer rowing technique, and the resulting power output, was determined for the New Zealand junior men's rowing eight and a reserve. Pre- and post-training testing consisted of four one minute rowing trials at 25 strokes per minute with two minutes rest between trials:
- No goggles and no verbal instruction.
- Goggles and no verbal instruction.
- No goggles and verbal instruction.
- Goggles and verbal instruction.

Rowers trained with the goggles for 20 minutes a day for four days during ergometer rowing before being retested. Analysis of the rowing stroke was performed using siliconCOACH® and Rowperfect® software. Following four days of ergometer training with the GTS there was a 20 to 29 per cent increase in power output across all four trials. There were no significant differences in stroke length, lumbo-pelvic angle or knee flexion angle for any trials. However, there was a trend for an increased pelvic angle at the catch (reduced lumbar flexion) in all trials.

A further study was conducted to assess the immediate and training effects of visual feedback through the GTS on lumbo-pelvic angle for eight female NZ national rowers during on-water rowing. A cross over design with alternate GTS and verbal

feedback training sessions for five days was utilised. Testing before and after the training consisted of four one minute rowing trials at 28 strokes per minute with:

- No goggles and no instruction.
- Goggles and no instruction.
- No goggles and instruction.
- Goggles and instruction.

The GTS significantly reduced lumbo-pelvic angle for two scullers and three rowers (4.9 to 20.6 per cent change in degrees) within one training session, however, there were no differences for ensembled averages for lumbo-pelvic angle.

Verbal feedback changed lumbo-pelvic angle by 5.7 to 30.3 per cent for two scullers and one rower. The results from these two studies support further use of the GTS as a tool for improving rowing technique. Rowing technique can be made visible through different biomechanical parameters of which stroke smoothness is the most promising.

From a technical perspective, according to Smith and Spinks (1995) important biomechanical variables in rowing performance are mean propulsive power output per kilogram of body mass, propulsive work consistency, stroke-to-stroke consistency and stroke smoothness. Zatsiorsky (1991) calculated several indices to assess technique including effort coefficient, work efficiency, stroke efficiency, effort build-up gradient, maximal force build up gradient and efficient stroke force. Stuble et al. (1998) concluded the angle of the back plotted on the Y axis of a plot against the extension of the legs on the X axis provides good information about the technique of rowing.

Current research with Rowing New Zealand elite crews involves the use of an instrumented boat. Oar position, oar strain, foot stretcher force, boat velocity, and seat position information can be provided to the athletes and coaches.

Chapter 14

Sports (Athletic) and Coaching

INTRODUCTION

Being a nation full of avid sports fans and players, interest in watching sports and participating recreationally continues to expand at a rapid rate. Some amateur athletes dream of becoming paid professionals, such as players, coaches, or sports officials; but very little actually succeed at making a full-time living as a professional athlete. Those who do beat the odds, discover short careers and insecure jobs. Disregarding the small chance of getting a professional job, there are several options for part-time coaching, instructing, refereeing, or umpiring in amateur athletics and in educational systems.

Athletes and sports competitors entertain spectators by playing in officiated and controlled sports. Athletes must know the strategies of the game and abide by any rules and regulations as they play. Athletes can compete in a variety of team sports, such as baseball, basketball, football, hockey, and soccer; and they can compete in individual sports, such as golf, tennis, and bowling. Just as sports can be different, so can the degree of difficulty, varying from unpaid high school athletics to the professional level where the supreme athletes play on worldwide television.

On top of playing in games, athletes also spend numerous hours in hard practices every day, perfecting skills and learning teamwork under the direction of a coach or sports instructor. They also spend more time analyzing video tapes, so they may critique

themselves on how they play and gain an advantage as they scrutinize their opponents' playing strategies and weaknesses. Some athletes receive strength training to build up muscle and endurance and prevent injuries. All levels of competition are very fierce and security in a job is always unstable. Consequently, several athletes must train consistently year round to keep exceptional form, technique, and good physical condition. There are very few breaks for professional athletes. In accordance to physical training programmes, athletes may also be required to go on strict diets during the prime playing season. Several athletes push themselves as hard as they can during practices and games, increasing their risk for injuries that could end their career. Minor injuries are detrimental as well because the athlete could be replaced.

Coaches instruct and arrange amateur as well as professional athletes in essentials of individual and team sports. In individual sports, instructors might often have these same responsibilities. Coaches prepare athletes for a competitive season through directing practices where athletes perform drills to improve their abilities and endurance.

Using their knowledge in the sport, coaches help the athlete with proper form and technique in beginning higher level exercises trying to make the most of the players' physical potential. In addition to supervising the improvement of athletes, coaches also are accountable for running the team during while practicing and competing, and for instilling in their athletes good sportsmanship, the spirit of competition, and working together as a team. They may also choose, store, issue, and stock equipment and supplies. During competitions, for example, coaches decide who will play to optimize fluid team work. Additionally, coaches conduct team strategy and impose certain plays during games to surprise and overpower opponents. To select the optimum plays, coaches assess or "scout" the opposing team before the competition, permitting them to decide on game strategies and certain plays. Several high school coaches mainly academic teachers who complement their income by being a part time coach. College coaches treat their jobs as full time; they travel frequently looking for potential players.

Sports instructors instruct professional andnon-professional athletes individually. They arrange, teach, train, and direct all types of athletes in sports such as bowling, tennis, golf, and swimming. Because sports are so diverse (from weight lifting to gymnastics to scuba diving) and may involve self-defence sports such as karate, instructors usually specialize in one or two areas. In addition to coaches, sports instructors also may have daily practices and be in charge of equipment and supplies. Using their sporting, physiology, and corrective technique expertise, they establish what the kind of exercises to use and how hard the exercises should be. They also give the athlete certain drills while correcting bad technique. A few instructors also give directions on using training apparatus like trampolines or weights, correct athletes' weaknesses and enhance their training. Sports instructors use their best knowledge to evaluate athletes and their opponents to devise a game strategy.

Because of their different focuses, coaches and sports instructors often approach athletes in various ways. For instance, coaches work with the team during a game to optimize their winning chances. On the other hand, sports instructors, like those who instruct professional tennis players, usually are not allowed to coach their athletes during competition. Sports instructors spend a lot of time working one-on-one with athletes, which gives them time to plan custom training programmes for individuals. It is challenging for coaches and instructors to encourage players; however, this is vital an athletes success. Several coaches and instructors get great satisfaction doing their job, helping children or young adults socially and physically to improve and learn skills that will promote achievement in their sport.

Umpires, referees, and other sports officials officiate at competitive athletic and sporting events by examining the play, identifying infractions of rules, and imposing penalties according to the sports' rules and regulations. They predict the plays and then place themselves in the best spot to see the action where they evaluate the situation and decide any violations. A few sports officials may work by themselves, such as those in boxing. Others such as umpires work in groups, such as baseball umpires. Officials' jobs are highly stressful in all sports because they are often have to

make a quick decision, sometimes causing strong disagreements among players, coaches, or those watching.

Professional scouts assess the abilities of athletes, amateur and professional, to determine their talent and potential. The scout is a sports intelligence agent who primarily finds the best athletes that will qualify for his or her team and down the road, will bring success.

Professional scouts usually work for scouting associations or do freelance work. As scouts search out new talent, they perform their work in secret so their opponents won't know of their interest in particular players. A college-level head scout is usually an assistant coach; however, freelance scouts may assist colleges as they provide coaches information about outstanding players. These scouts look for gifted high school athletes through reading the newspaper, talking to high school coaches and alumni, going to high school games, and reviewing videotapes of candidates' performances.

Athlete are known for having irregular hours. The coach, umpires, referees, and other sports officials also share these hours. Athletes, coaches, umpires, and related workers sometimes work weekends, evenings and even holidays. Through out most of the sports season and year, athletes and full-time coaches typically work more than 40 hours a week. A few coaches in educational systems, especially in high school, may coach several sports. Athletes, coaches, and sports officials may be outside in different weather conditions for a lot for outdoor sports; those coaching indoor have the luxury of climate-controlled facilitates, such as arenas, indoor stadiums, or gymnasiums. Athletes, coaches, and some sports officials travel regularly by bus, airplane, or car to scout out players at sporting events.

COACH/ATHLETE TRAINING ROLES

The roles of the coach and athlete in determining training requirements will change over the time an athlete is with a coach.

- When an athlete first starts in a sport/event (cognitive stage) the coach's role is to direct the athlete in all aspects of training (telling or showing coaching style).
- As the athlete develops and demonstrates a sound

technical understanding (associative stage) of the sport/ event then gradually the coach's role changes to one where the coach and athlete discuss and agree appropriate training requirements (involving coaching style).

• As the athlete matures and demonstrates a sound understanding of training principals (autonomous stage) then the athlete will determine the training requirements. The coach's role becomes one of a mentor providing advice and support as and when required.

COACHING SKILLS

As a coach you will initially need to develop the skills of: organising, safety, building rapport, providing instruction and explanation, demonstrating, observing, analysing, questioning and providing feedback.

Organising

In organising the training session you need to plan in advance how you will manage the athletes, equipment and area - group athletes accordingly to numbers, ability and the activity - continually check the plan is safe during the session.

Safety

In providing a safe environment for the athletes you must assess the risk of: the area, equipment and athletes - continue to assess risk throughout the session - keep athletes on the set task and follow correct practice and progressions.

Building Rapport

In building rapport with the athletes learn and use their names, smile and make eye contact, coach the athlete rather than the sport, show interest in and respect for the athletes.

Instruction and Explanation

In providing Instruction and Explanation you should think about and plan what you are going to say, gain the athlete's attention, ensure they can all hear you, keep it simple and to the point and check they understand by asking open questions.

Demonstration

In providing demonstration make sure you are in a position where the athletes can clearly see and hear you, identify 1 or 2 key points for the athletes to focus on, repeat the demonstration in silence 2 or 3 times (side, back and front view), ask if they have any questions and check they understand by asking open questions. There are times when it might be more appropriate to use someone else to provide the demonstration.

Observation and Analysis

In observing and analysing break the action down into phases, focus on one phase at a time, observe the action several times from various angles and distances, compare the action with your technical model and if appropriate determine what corrective action is required. Remember your ears can also be used to observe - *e.g.* listen to the rhythm of the feet of the hurdler.

Feedback

In providing feedback encourage the athlete to self analyse by asking appropriate open questions, provide specific and simple advice, limit the advice to 1 or 2 points, check they understand what they will do next and make the whole process a positive experience for the athlete.

COACHING HAPPENS IN A CONTEXT OF TRUST

As Warren Bennis and others have suggested, coaching by its nature is very personal and is based on a unique and profound level of trust between the coach and those being coached. While coaching is not therapy, the quality of the relationship is similar and the consequences, whether positive or negative, can be just as profound. This is because the coaching relationship is based on two key elements. The first is that the coach is a competent observer and is responsible for generating a possibility with the coachee that is larger than what is available in the coachee's historical reality.

This necessitates a level of faith on the part of the coachee that the coach is acting solely in the coachee's interests. Second, the objective of the coaching relationship is to empower the

coachee to take unprecedented action that more often than not is contrary and counterintuitive to the experience and historical competence of the person being coached. Consequently, the coachee is required to take significant personal risk to realize the benefits of the coaching relationship. If successful, the benefits are obvious and validate the coaching process. If unsuccessful, the coachee must be prepared to deal with and be responsible for potentially negative consequences.

When a group of seminar participants was asked to distinguish between morals, ethics and values, this was their most useful interpretation: *Morals are the rules of God, ethics are the rules of a community and values are our individual rules*. Ideally, these rules are aligned and coherent and become our framework for living. In most cases, however, we are faced with choices where the rules are not always clear or may seemingly be in conflict. Moreover, in many cases our actions are not so much a product of deliberate choices as natural or automatic responses to situations and circumstances in which the prevailing ethic is governed by conventional wisdom, expediency, habit or trial and error.

In the federal public service, most leaders are familiar with the Report of the Study Team on Public Service Values and Ethics, prepared with the guidance of the late John Tait. That report proposed four lenses for thinking about values:
- Democratic values
- Professional values
- Ethical values
- Personal values

This offers another way to look at the standards and expectations we hold of coaches and their professional conduct. In reading the remainder of this chapter, it may be useful to consider the connections to these categories and the implications for those coaching within a public sector context.

We believe that for coaching to become a widely respected discipline or profession, there must be an agreed upon set of rules to govern our practice. In the absence of such rules, coaching may indeed become a passing fad and the potential of coaching as a new and empowering paradigm for organisations and management may be lost. We invite coaching colleagues and clients to engage

this proposal as a starting point. This chapter offers a foundation that can be enriched or expanded based on whatever experience and commitment can be brought to bear. Here then are the ïrules' – the code of ethics – we propose.

A COACH IS CLEAR ABOUT THE LIMITS OF HIS/HER COMPETENCY

Competency is defined as the ability to make and keep promises. One of the paradoxes of coaching is that the coach does not need to know as much as the coachee in a particular field to be an effective coach nor does she need to be able to perform at the level of the coachee. This is obvious if we look at coaches of professional athletes or performing artists. Yet the coach does need to be able to promise a result that is beyond the capability of the coachee to accomplish by herself. For example, a person can be competent to coach people in such areas as their relationships with other people, their communication, how they observe themselves and their circumstances, and their relationship to their own commitments. Breakthroughs in these domains can be powerful for almost anyone in any field of work. That same coach may not be competent, however, to write computer programmes or undertake market research or prepare a balance sheet. The ethical issue is this. A coach needs to know enough about the areas being coached to listen effectively. At the same time, the coaches interventions should be focussed on the coachee's commitments and coaching requests.

A coach is always working with the phenomenon of "cognitive blindness," the boundary between 'what we know' and 'what we don't know that we don't know.' This is the area where coaching is powerful and valuable since none of us can observe ourselves in action nor can we observe our own world view. If a coach isn't vigilant and aware of her own blindness, the distinction between expertise and opinion can be lost. When this occurs, the coaching can be reduced to giving advice and there is a danger of the coachee acting on the view of someone less competent than himself.

One indicator of a coach's awareness and management of her own blindness is that she maintains a relationship with a coach herself. It is good to be suspicious of anyone purporting to be a

coach who is not also a great coachee. We recommend that anyone hiring a coach ask explicitly in what areas is the person not competent. This does not restrict the coach from ever giving advice, but when aware of her limits of competency she is able to clearly announce that "this is not coaching" and in doing so manage the potential for confusion or unintended outcomes.

Professional and Clarifies the nature of the Coaching Process

A mark of professionals in any field is that they are very clear with their clients about what they do and do not offer. These promises may be recorded in writing and become a basis for later evaluation of results and value added. In a coaching relationship, there should also be a clear articulation of what is required of the coachee. Establishing expectations is important not only because it is a good professional practice, but also because the nature of the coaching relationship is inherently dynamic.

Neither the coach nor the coachee can predict nor should they proscribe what the process will be. It will change and evolve over time and in most cases involve creativity on the part of the coach. Consequently, clarifying the ground rules establishes a frame of reference in which the individuals can work. At the same time, the coaching client may well make new requests as he discovers the possibility of achieving results in areas other than those initially considered. Finally, the coach will be responsible for clarifying the nature of the coaching relationship, particularly with respect to the power of choice exercised by the coachee. In summary, the coach should be explicit about the coaching process, content, and relationship.

One reason that it is important to get the "agreement" clear at the beginning of a coaching relationship is that coaching can be extremely uncomfortable for the person being coached. Historical inertia and patterns of behaviour are often difficult to break and require exceptional clarity and commitment to do so. Coaching requires "unreasonable" actions on the part of the coachee, which can generate considerable resistance and rationalization that can either undermine the value of the coaching or produce classical "power and control" games between the coach

and coachee. Part of any agreement should include a mutual understanding of where boundaries exist, what are the protocols and practices for dealing with expected resistance, and any other pitfalls that can be anticipated. Coaching works only when power and choice are vested in the coachee. A failure to understand and clarify this at the beginning of the relationship can result in the coach either assuming or being given a traditional authority-control role in the relationship. This will negate or obscure the value of the coaching and even if results are produced, the coachee may become co-dependent upon the coach for sustaining the results.

Coaches Recognize the Value of their Work and Maintain Professional Integrity

We believe that coaching is a privilege. When we coach others, they grant us permission to observe and intervene in their lives and in how they are 'being' in their work and in their world. The special trust required of them for the coach to make a contribution is exceptional and can only be regarded as a gift. The relationship is analogous to that typically found with doctors, priests, therapists, or very close friends. When someone relates to another this way, it is always possible to abuse or take advantage of the trust. This abuse can be sexual, political, economic, or personal domination. All such forms of abuse are inappropriate.

One way to acknowledge and maintain this special relationship is to clarify exactly what the basis of compensation will be (if any) and rigorously reject any temptations to benefit beyond the pre-established terms. In an organisational context, this may be implicit in the managerial relationship, however, it is incumbent on the coach to make it explicit, just as he would if operating as an independent practitioner. We believe that coaching is a valuable service and we set daily or hourly fees based on what we and the client consider to be appropriate.

Once established and agreed upon, practices should be developed that keep the relationship on a professional level. When the coachee accomplishes breakthroughs, they can experience extraordinary emotion and gratitude. In some cases, these breakthroughs can be "priceless" or worth many times the cost of

any fees. It is important to always acknowledge that the result belongs to the coachee and that the coach has already been compensated, whether formally or simply from the satisfaction of empowering others.

In addition to establishing set fees to prevent inappropriate remuneration, there are other ethical issues which must be considered. One common abuse of coaching by professional consultants is to use coaching as a way to gain entry and preferred access to larger consulting contracts within the client's organisation. While many coaches are also qualified as trainers or management consultants, the relationship with the client is compromised if the coach uses it for such business development purposes. Another common example of abuse of the coaching relationship is the covert use of the coachee as a vehicle for promoting or marketing coaching to others. And since coaching involves a level of trust and openness, there is the possibility of sexual attraction. From an ethical perspective, encouraging or acting on such attraction would be another clear form of abuse.

A Coach has Clear and Observable Criteria

A common question is, "How can we measure the results of a coaching relationship?" This is difficult to answer because breakthroughs are inherently unpredictable. If a result can be predicted it isn't a breakthrough. Measurement is also difficult because the result of coaching occurs first and foremost in the coachee's '*way of being*,' which becomes the context for the coachee's actions and the coachee's results. It is holistic in nature. Our answer to the above question is always that the only place to look for the results of coaching is in the actions and the results of the coachee. The only criteria possible are the declared commitments of the coachee that, in his view, he could not have accomplished by himself.

An important aspect of most coaching relationships is that, while the commitments agreed upon at the beginning are a base line for assessing results, they are not necessarily the only results that will be produced. Because of the holistic nature of the process, coachees frequently report results in other domains. For example, although most of our coaching is in the context of work, results

often occur in people's relationships with family or with themselves. We recommend a practice in which the coach and coachee frequently and rigorously assess outcomes in a variety of areas and document these over time. Such documentation is valuable because as breakthroughs occur there is a natural tendency to forget where one began, which increases the likelihood that the coaching relationship will not be correlated with the results.

It is possible that the results from a coaching relationship may be acceptable or satisfactory and not be a breakthrough. These results should obviously be appreciated and acknowledged, but in our view they are also the kinds of results that can and should be available from other types of developmental relationships such as skills training, counseling, mentoring, normal supervision and even self-study. What distinguishes coaching as a discipline is its focus on achieving more than incremental improvement. The objectives of coaching are unprecedented actions and results on the part of those they coach.

Community and Empowers the Profession and Community

One-way to distinguish a profession from other kinds of work is that a profession is a community of practitioners that draw their identity and practices and to some degree their power from the community. They are not merely members of a club or association, but they relate to their colleagues as contributors to the field and as sources of new thinking and inspiration. While competition always exists within a profession, competition is not the primary factor governing strategy and action.

There is a larger commitment to the clients and to the profession as a whole including general adherence to its traditions and practices. For example, a surgeon will not normally perform a procedure on a close relative, not because he or she isn't capable, but because the profession has declared that the risk of losing objectivity is inappropriate. This kind of solidarity is two-way in the sense that the individual derives power, knowledge, and value from the community and the community exists by virtue of each individual practitioner's responsibility and commitment to the community.

At the present time, there is no recognised group or organisation that represents those who are practicing coaching either professionally or as part of another profession or organisational role. Several associations exist and many coaches work with others in informal arrangements. At this point, there are no widely recognised licensing authorities or agreed standards for what constitutes the discipline of coaching.

The International Coach Federation is contributing to the development of such standards and has an accreditation process for Coach Training Programmes. This sort of formalisation of the profession is emerging but is not yet clearly endorsed by coaching practitioners. For this reason, it is important that anyone offering coaching be clear with those they coach about their qualifications, experience, references, and the underlying basis for their practice. Similarly, those people about to begin a coaching relationship will want to be clear about how prospective coaches' qualifications fit with their needs.

COACHEE ACCOMPLISHING BREAKTHROUGHS

When a coach can no longer be responsible for this possibility, he will withdraw from the coaching elationship. Another paradox of coaching is that breakthroughs are always occurring at the boundary between what is realistic and reasonable and what is unrealistic and unreasonable. Before Roger Bannister broke the 4-minute mile, there was no evidence that it was possible. Possibilities do not exist in reality, they only exist in the vision and commitment of human beings.

If they existed in reality, they would be examples. One of the primary values of a coach is the ability to clarify and own the possibility of a coachee accomplishing the unprecedented in the face of a history in which there is no evidence that such a breakthrough could happen.

When we coach, we always deal with two people: first, the person with whatever history, talents, and knowledge she might possess, and second, the person as a possibility. A coach is always relating to the latter. If we stop relating to the person as a possibility, then we inevitably will fall into attempting to fix the person rather than empowering her to accomplish the

results herself. People often ask, "When do you give up coaching someone?" There may be many reasons to terminate a coaching relationship. One reason might be that the coachee is unwilling or unable to trust the coach. Another reason might be that the coachee's commitment to accomplishing a breakthrough result changes. Perhaps there is simply insufficient time, interest, or resources to do the necessary work. A coach will also give up when he can no longer see and be responsible for the possibility for which they are working. This is important because the coach is often the only one who sees the possibility when the conventional wisdom or the coachee does not. When the possibility disappears, then so does the reason for coaching. In all cases, if the coaching relationship is not terminated, it can devolve into a process of mutual rationalisation or co-dependence that is generally unhealthy and unproductive.

A Coach is Responsible

Like Harry Truman, a coach works in a context of "the buck stops here," not as a function of authority, but of responsibility. Another paradox of coaching is that, while the coach is 100 per cent responsible, she must relate to the coachee or the team in a way that allows them to also be 100 per cent responsible. When coaches deny their responsibility and blame winning or losing on the circumstances or on those they coach, they are undermining both themselves and the coachees and they will lose the context in which coaching is possible.

Responsibility is defined here as the "ability to respond," as distinct from taking on an assumption of blame or credit either before or after the fact. Being responsible means accepting, even owning, what happens in our world. This notion of responsibility opens a different relationship with the circumstances in which we find ourselves, including everything that has occurred, is occurring or might occur. As coaches, we promise breakthroughs. If they do not occur, then we are responsible for not keeping our promise.

Successes and failures are relative to the observer and the time frame of the activity. Losing a game doesn't constitute a failure in the context of an entire season. It is always possible to

criticize a strategy or process after the fact. A coach, however, is focused on action, outcomes, and the future, not on differing interpretations or stories of why something did or did not work out.

The point is that the ethical behaviour of a coach must be guided by her moment-to-moment judgements in the context of responsibility. This is a coach's way of being because the results of a coach are accomplished without control or force. This requires being fully ïpresent' and clear with respect to what is occurring in the conversations with the coachee and also present to the intended outcomes. If the coach attempts to control the actions of the coachee, then the coach's behaviour is a re-action to what is occurring. This is a sign that the coach has been co-opted by the circumstances or the coachee's story thus negating any possibilities for breakthroughs.

Success or failure is declared at the end of whatever time frames are established for the coaching. There are no clear rules for what the consequences should be if the results are declared a failure. In sports, failure may mean loss of the opportunity to continue coaching; in business, it may be payment of a penalty or return of some portion of fees. Failure may also be handled by a simple apology and a commitment to redesign the coaching strategy. The point is that coaches must be responsible or they will lose the relationship and creative context with those they coach. Coaching then becomes just another part of the game and loses the power to empower others.

Clear Distinction Between Coaching and Other Kinds of Helping Relationships

In our interpretation of coaching, one of the central ideas is that coaching changes the way people observe themselves in relation to their situation. This doesn't happen as a function of new knowledge or information, nor does it occur because they are given a new model. This kind of change is ontological in nature, a shift in a person's ground of being or context. This is also a way of describing what occurs when a person has a new opening for action. Historically, the subject of "being" has been addressed from many perspectives and generally regarded as psychological or

spiritual in nature, which is why coaching is often regarded as an advisory role.

From our point of view, coaching has nothing to do with those disciplines or approaches that seek change through self-understanding or insights based on new information. Coaching is grounded in different paradigms and traditions and, while it may or may not have similar objectives to other disciplines, it is distinct. For example, counselors or therapists are often oriented towards fixing or revealing something related to a person's 'internal state.' Coaching is exclusively concerned with action and relegates issues like motive and internal state to the responsibility of the person being coached.

Given this view, it is dangerous when coaches attempt to resolve or promise to deal with human behaviour or other phenomena from any perspective other than coaching. A coach is not normally a therapist, although some therapists are capable of offering coaching as a distinct aspect of their practices. One way to manage this potential confusion between disciplines is by rigorously avoiding "why" questions with the coachee. For example, when taking a risk, it is natural and common for a person to feel fear. Most people want to understand why they are afraid and have the coach help eliminate the fear. As a coach, it is important to have compassion and acknowledge the fear, but it is not the coach's job to make coachees feel unafraid. Rather, the coach's job is to empower the coachees to take action whether or not the coachees are afraid.

This distinction is particularly important when working with people in areas which are also the concern of other professions. Coaching and other disciplines deal with matters such as trust, being authentic, distinguishing recurring patterns of inaction or ineffectiveness and impacting upon cultural values such as responsibility, accountability, risk-taking, courage, and being able to complete and put the past in the past. Clarifying the distinction between coaching and other disciplines, including the theoretical foundations and practices upon which coaching is based, is important for preventing confusion. Avoiding any misrepresentation or confusion is the ethical responsibility of the coach.

A Coach is Committed to the Commitments of the Coachee

When we approach coaching, the power in a coaching relationship is always with the person or persons being coached. Thus, the senior context for coaching is to serve. A summary description of the coaching relationship is that the coach 1) listens for the commitments of the coachee, 2) observes action, and 3) interacts with the coachee until the actions and the commitments are in harmony.

This harmony represents optimum performance. Beyond it, the coach works to assist the coachee to invent bigger possibilities, formulate new commitments, 'complete' past successes and failures, and sustain new competencies and results.

From our perspective, this is the ultimate ethic: *to be committed to the commitment of the other*. Many times this means being *more* committed to the other person's commitment than he is.

It means being a support *for* the other person when they forget or are struggling with all the ways human beings have for giving up, or rationalizing away possibility, or avoiding being uncomfortable. It means giving the person absolute choice while at the same time having compassion for the difficulty of reinventing oneself consistent with a new commitment. A coach never needs to use force if she is clear within herself and with the coachee that choice and commitment rest with those being coached. It is the coach's authentic commitment to those she coaches that becomes the context for breakthroughs and unprecedented action.

No human being can observe himself or herself in action. This is why virtually all professional athletes and top performers always maintain relationships with a coach.

In "Coaching and the Art of Management," coaching is described as a dyad — it cannot occur except in relationship with another. It is in the relationship between the coach and the coachee that the results are created, even though the action that manifests the results of the coaching is the responsibility of the coachee. The coach is not a critic of the player; she observes what the player cannot observe for himself.

SPORTS (ATHLETIC) AND COACHING TRAINING AND JOB QUALIFICATIONS

According to various levels and types of sports, education and training qualifications for athletes, coaches, umpires, and other workers differ significantly. Every job requires a great deal of knowledge about the sport that is typically acquired after having years of experience at lower levels.

Most athletes have played their whole life, starting in elementary school and continuing to play through high school and sometimes college. They compete in amateur competitions and on teams in high school and college, where professional scouts can observe them. The majority of schools mandate athletes to obtain specific academic requirements to maintain eligibility to play. It takes years of effort to become a professional athlete. Those wanting to play professionally must obtain amazing talent, desire and devotion to training.

High schools typically prefer to hire teachers to be coaches and instructors that will work part-time. If they can't find someone suitable, they hire an outside coach.

A few entry-level positions for coaches or instructors mandate merely experience resulting from participation in the activity or sport. Several coaches start out as assistant coaches to acquire the necessary knowledge and experience required for advancing to head coach. Head coaches working at bigger schools who endeavor to contend at the uppermost levels of a sport require considerable experience coaching as a head coach of a different school or as an assistant coach. To achieve professional coach status, it typically takes several years of coaching and winning at the lower levels.

A bachelor's degree is required for all levels of public secondary school head coaches and sports instructors. (Information on teachers, including those focusing on physical education, can be found in the section on teachers—preschool, kindergarten, elementary, middle, and secondary are in another place in the Handbook.) It is required for those who are not teachers to meet specific State qualifications in order to certify to become a head coach. Private school coaches and sports instructors may not have

to reach these same standards to certify. Course in degree programmes include the following: exercise and sports science, physiology, kinesiology, nutrition and fitness, physical education, and sports medicine.

For sports instructors wanting to instruct tennis, golf, karate, or anything else, certification is highly recommended. Sometimes, an individual must be CPR certified as well as 18 years old. Different certifying organisations particular to a sport have various requirements and training according to their expectations. One must participate in a clinic, camp, or school in order to certify. Those working part-time and in smaller places have a lower chance of needing formal education or training.

Umpires, referees, and other sports officials have certain requirements for each sport. They usually volunteer for intramural, neighbourhood, and recreational league competitions to start out their career. College referee candidates have to be certified through an officiating school and be assessed during a trial period. A few bigger college leagues mandate officials to be certified with further qualifications, such as being a resident in or near the league's boundaries and having prior experience that usually includes numerous years refereeing at high school and college level conference games.

Qualifications for professional sport officials are even stricter. For example, an umpire for professional baseball must have a high school diploma or an equivalent plus perfect vision and fast reflexes. However to certify for a professional position, it required that potential candidates go to professional umpire training school. At this time, the Professional Baseball Umpires Corporation (PBUC) has approved two schools curriculums for training. Leading graduates are chosen for additional assessment as they officiate in a rookie minor league.

Umpires, prior to being considered for major leagues, frequently need 8 to 10 years of experience in different minor leagues. In football candidates are required to obtain a minimum 10 years of officiating experience, with 5 of them at a collegiate varsity or minor professional level. Prospects for the NFL must be cross-examined by clinical psychologists to evaluate intelligence level and capability of handling tremendously stressful

situations. Additionally, the NFL's security department carries out detailed background checks. Potential candidates are probably interviewed by a board from the NFL officiating department and take a comprehensive test about the association's rules and regulations.

A scout's requires experience playing professional or college sports. This knowledge allows them to recognise young players who have astonishing athletic talent and skill. The majority of starting scouts jobs include spotting talent in a certain area or region. Working hard and having success can lead to full-time jobs in charge of bigger regions. A few scouts proceed to scouting director positions or different sport executive positions.

Athletes, coaches, umpires, and related workers possess developed skills in communication and leadership as well as being able to relate to others. To successfully instruct and encourage individuals or groups of athletes, coaches also must be creative and adaptable.

SPORTS AND COACHING JOB AND EMPLOYMENT OPPORTUNITIES

Through the year 2012, employment of athletes, coaches, umpires, and related workers is projected to rise about as fast as the average for all occupations. Employment will grow due to the general public persisting to participate more and more in formal sports for entertainment, recreation, and exercise. Job expansion will also be pushed by the growing numbers of baby boomers about to retire, during which they are projected take part in leisure-time activities, like tennis and golf, and need instruction. Active participants in high school athletics will be the posterity of the baby boomers, requiring more coaches and instructors.

Increasing opportunities are estimated for coaches and instructors because physical fitness is becoming more important in our society. All ages of Americans are participating in extra young and lower-leveled athletic competitions, are becoming members of athletic clubs, and are being motivated to engage in physical education. Coaches and instructor employment also will expand with increasing programmes for athletes in school and college and rising need for private sports training. Job expansion relating to sports among education will be determined by local

school board decisions. Population expansion commands the building of more schools, especially in the developing suburbs. Nevertheless, when budgets become tight, financial support for athletic programmes is usually cut first. Because team sports are so popular, they are able to compensate by assistance from fundraisers, booster clubs, and parents.

State-certified academic and physical education teachers are likely to be optimum candidates for becoming coaches and instructors. Coaching opportunities will arise from the need to change several high school coaches.

Professional athlete jobs will persist to be highly competitive. Opportunities to have a career in professional sports, such as golf or tennis may increase as novel tournaments are founded and participant receive more prize money. The majority of professional athletes' careers are relatively short because of incapacitating injuries as well as age. As a result, a large fraction of the athletes in these jobs are changed each year, opening a few job opportunities. However, far more gifted young men and women have hopes of becoming a sports celebrity and will be competing for a restricted number of job openings. Persons seeking part-time umpire, referee, and other sports high school level official jobs will have the optimum job opportunities; however, competition is probable for college level jobs with higher salaries and additional competition professional level jobs. Competition is expected to be very intense for scouts, certainly for professional teams who have limited positions.