# Do Sport Sciences Really Help in Producing Better Athletes?

**(Part A)**

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## ABSTRACT

*Sport science is a discipline that studies how the healthy human body works during exercise, and how sport and physical activity promote health from cellular to whole body perspectives. The study of sport science traditionally incorporates areas of Exercise Physiology, Sports Psychology, Kinanthropometry, Biomechanics, Training Methods, Sports Nutrition, Biochemistry and Sports Medicine.*

*This review article tries to summarize the ways in which three of the above said disciplines i.e. Sports Psychology, Kinanthropometry, and Training Methods help shape better athletes. The illustrated methods have been tested repeatedly over world and have been in use since the inception of the NSNIS and other major centers of Sport Authority of India.*

*This article intends to provide the reader a broad perspective of how the sport sciences can help realize the athletes their maximum potential.*

Sport scientists and performance consultants are growing in demand and employment numbers, with the ever-increasing focus within the sporting world on achieving the best results possible. Through the study of science and sport,

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researchers have developed a greater understanding on how the human body reacts to exercise, training, different environments and many other stimuli. Sports scientists from the areas of Exercise Physiology, Sports Psychology, Kinanthropometry, Biomechanics, Training Methods, Sports Nutrition, Biochemistry and Sports Medicine carry out the following activities in general:

- Devise treatment and exercise programs that support an athlete's preparation and recovery, and assist sports person to return to training or competition
- Conduct experiments, make observations and interpret data in relation to sporting performances, and communicate findings to officials, athletes, coaches and other support staff.
- Design or assist in designing training programs for sportspeople to improve sporting performance without causing injury, or to strengthen particular areas of the body
- Refer clients to medical and paramedical specialists such as orthopaedic surgeons, rheumatologists and Physiotherapists
- Assist with psychological issues

A broad enumeration of the how specifically the sports sciences like Sports Psychology, Kinanthropometry, and Training Methods help shape better athletes is as follows:

**(A) Sports Psychology**

Sports psychology is

- The study of the psychological and mental factors that influence and are influenced by participation and performance in sports, exercise and physical activity, and
- The application of the knowledge gained through this study to everyday settings.

Sports psychology professionals are interested in how participation in sports, exercise and physical activity may enhance personal development and well being throughout the life span. Sports psychologists are also involved in assisting coaches in working with athletes as well as helping improve athletes' motivation.

**Scope of Sports Psychology**

In sports, we find many problems which are faced by our players and athletes, which are psychological in nature

- Emotional reconditioning
- Motivational technique for learning new skills
- Psychological preparation for a contest and the hazards involved in it
- Motivation for peak performance
- Teaching and coaching methods
- Perceptual development and the learning of movement patterns
- Relationship of personality traits to athletic prowess etc.

To obtain scientific information concerning these problems of motivation, motor learning, emotional involvement, perceptual development and theories of personality, we have to look forward to the knowledge of psychology. We have to study need and drives, feelings and emotions, reflexes and reaction time, anxiety and aggressiveness, sensation and perception, principles of transfer of learning and many other psychological phenomena in the field of sports. (Frost, 1971)

Sports being a psychosocial spirit loaded with competitive and co-operative spirits, give rise to psychological stresses and strains, especially when an athlete has to face an unexpected defeat. The coach, with the help of psychological knowledge would

train the athlete to handle such a situation in a true sportsman spirit. The training should induce in the player the skill of adaptability to the psychological stress and strain. Emotional problems can be handled, so that the players can fascinate in a realistic manner and proper spirit.

The coaches as well as others who are interested in the improvement of athletes' performance have to face questions such as:

1. How can highly skilled performance be developed?
2. What factors should be emphasized to enhance the learning situation?
3. What factors of growth and development need to be considered?
4. What is the role of personality profiles or specific traits in contributing to the outstanding achievement?
5. What are the main areas where experimentation in sports is needed?
6. How the interpersonal and social relationships between the individual players in the same group affect the performance of the team?
7. What types of psychic problems occur in the field of sports?

To answer these questions, one has to take help of knowledge of various areas of psychology; e.g. psychology of learning, experimental psychology, personality, clinical psychology, developmental psychology as well as social psychology. There are abundant analytical psychological research materials, which is applicable to athletic and sports situations.

Singer (1976) has given five different facets of sports psychology as below

| Developmental | Personality | Learning | Social | Psychometrics |
|---|---|---|---|---|
| Optimal learning and performance | Adjustment problems | Learning process and variables | Group dynamics | Measurement of individual differences |
| Maturational: Heredity and experiences | Self concept, motivation, persistence | Factors influencing skill acquisition | Competition and cooperation | Group differences |
| Processes: Childhood, Adolescence, Maturity & Aging | Direction & psychological effort | Administration of practice sessions | Leadership | Ability, aptitude and skills |
| Aging disabilities | Attributes and success | Performance variables | Spectator effects | Personnel selection |
| | | Ergonomics | Peer effects | Prediction of success |

The researches of these psychologists provide a basis for understanding and predicting behavior of the sportsmen at various age levels. The knowledge helps us to know about

- Personality traits of the sportsmen and their relationship with the sports performance.
- Psychological conditioning of the sportsmen.
- Psychological preparation of the athletes and players I.e. motor learning or skill acquisition.
- Psychology of audience, which affects the performance of the players.
- Psychological causes of poor

performance and the psychological effects of top performance.
- Psychological principles applied in the field of sports and physical education.
- Psychological aspects of sports training.

**A psychologist can help the athletes and sports person by**

- Discovering changes they can make to help them move to the next level of performance
- Learn to cope better with the pressure of competition
- Bounce back faster from injuries and losses
- Enhance their focus and concentration
- Develop the mindset of a winner

**Some interesting sub fields within sports behavior are**

- Teaching research in sports sciences and working with athletes on performance enhancement
- Teaching research in psychology and also working with athletes
- Providing clinical/counseling services to various populations including athletes
- Heath promotion and working with athletes, but not necessarily directly in sports psychology
- Coaching of youth
- Psychological kinesiology

A typical model of intervention in SportsPpsychology is provided in Annexure-1.

**(B) Sports Anthropometry/Kinanthropometry**

- Anthropometry means the measurement of man, whether living or dead, and consists primarily in the measurement of the dimension of the body.
- Sports anthropometry/Kinanthropometry is defined as the study of human size, shape, proportion, composition, maturation and gross function in order to understand growth, exercise, performance and nutrition.

**Role of Anthropometry in Sports**

- Provides a standardized technique for measurement of height, weight, circumference, skinfold, diameter.
- Prediction of physique, body fat %, body type, lean body mass of an individual.
- Identification of talent in the early age and selection of sport event.

**Objective**

- To produce a high level sport person through the knowledge of Anthropometry.
- To achieve this goal,
  - Focus should be on the identification of sporting talent and then on its development.
  - Physical characteristics of the athlete that are important in a particular sport must be present (physical capacity).
  - Prediction of adult Height.
  - Age and maturity of the athlete has to be concerned.

**Fundamental aspects of Sports Anthropometry:**

- Human growth and development
- Body composition
- Physique and somatotype
- Talent selection

**Parameters of Anthropometric measurement:**

- HWR (Height Weight Ratio)
- BMI (Body Mass Index)
- Somatotype (endo.- meso.- ecto.)
- Fat%
- Body composition:
  - Muscle mass, Bone mass, Fat mass and remainder.

**Empirical findings**

- According to Carter and his associates (1982) the athletes who wish to achieve success in sports at a high level, can compare their physique with those of Olympic athletes.
- Early maturers are often taller, heavier, more powerful and faster than their counterpart during the early to mid teenage years. This has often led to selection biases in sporting competitions grouped by chronological age (Helsen, Van Winckel, and Williams, 2005).
- According to Macek and Vavra (1980), increase attention has been paid to the sports in childhood and adolescence, since it has been realised that top-performance in many sports is reached only if appropriate sports training is started at a very early age.
- The athletes who were lean or less fatty but heavy because of a well developed musculature were superior in certain competitive sport (Sodhi, 1986).
- Tanner (1964) examined the physique and body composition of Olympic track and field athletes at Rome during 1960, and inferred that the athletes were, both, born and made.
- Further he stated "the basic structure" must be present for the possibility of being an athlete to arise.

**Hence it can be concluded that**

- The role of morphological characteristics in the performance of various sports event has undoubtedly been established by now and biomechanical explanation of a particular type of physique being more advantageous to the other in performance have been put forth (Tanner, 1964; Carter, 1970; Singh, 1973; Sodhi, 1976; Ross et,al. 1982).
- Knowledge of Sports Anthropometry could be fruitfully utilized in sport activities to reap the optimum benefit in desired direction.

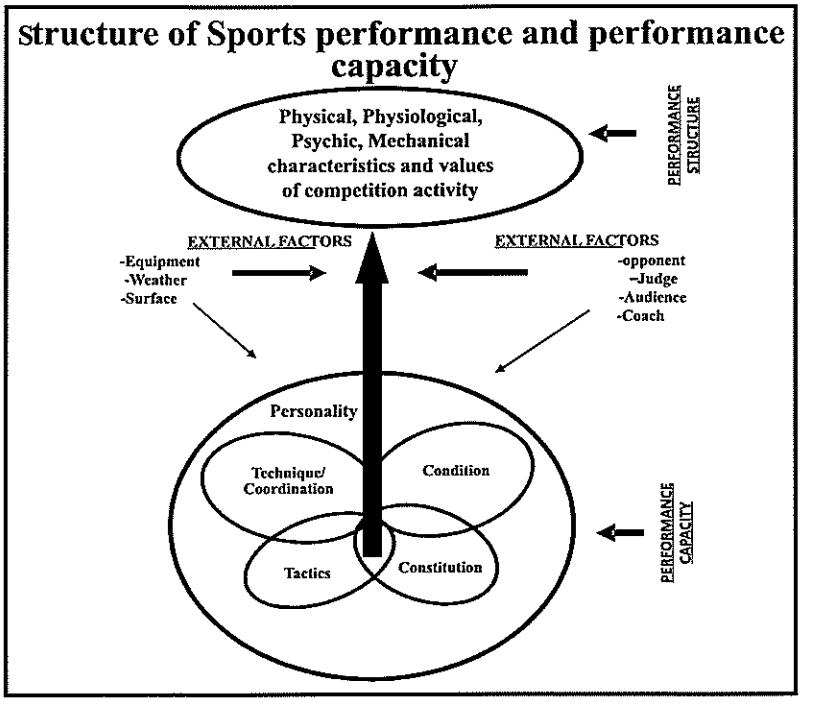
**(C) GTMT/Science of training and Sports performance**

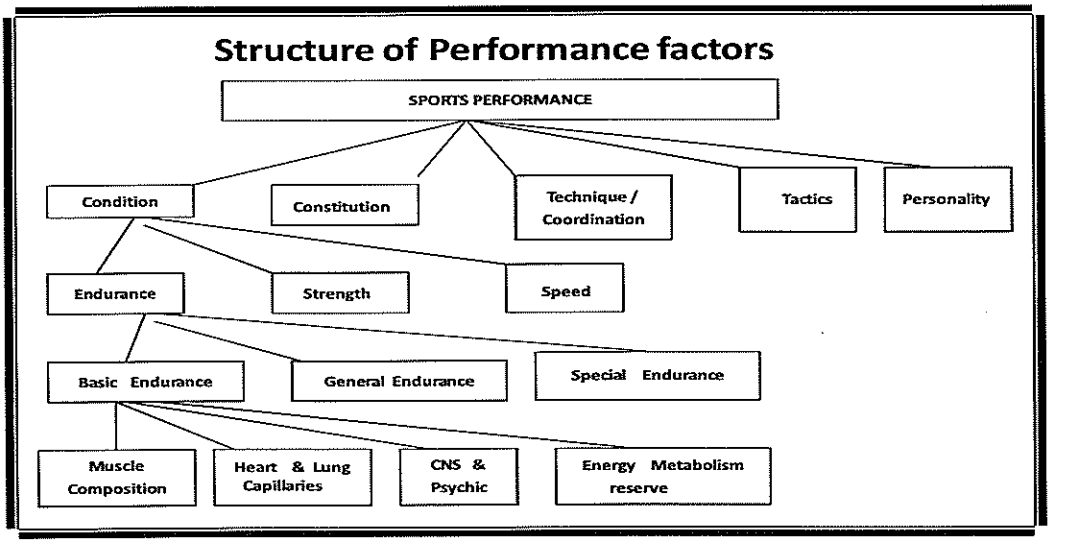
Sports are an important means of physical education for the development of society. Sports activities are being used for better health, better use of leisure time, recreation, rehabilitation and development of many other social aspects of healthy citizens of a nation. School sports, industry sports, recreation sports, rehabilitation sports, fitness sports and performance sports are some of the important areas of sports.

An increase in no of sports disciplines, no of participating countries, no. of participant, no. and level of competitions and involvement of financial aspect shows an increase in the popularity of Performance sports.

Sports performance is a unity of execution and result of sports action/actions measured/evaluated according to socially determined and agreed norms. Sports performance is indeed an aspect of complex human performance which has several aspects or dimensions. Hence several disciplines of sports science are required to work in a coordinated manner to explore the nature of sports performance and the process of improving sports performance.

To fulfill the demands of sports training and sports competition several sports sciences came in to existence to study training and performance. Each sports science except Training Science, deals with a particular aspect of sports training and performance. Training science is further divided in to two separate but highly interrelated and interdependent areas known as General Theory and methods of Sports training (GTMT) also called science of Training or Training methods and Theory and methods of different sports.


Structure of Sports performance and performance capacity
Physical, Physiological, Psychic, Mechanical characteristics and values of competition activity
PERFORMANCE STRUCTURE
EXTERNAL FACTORS
-Equipment
-Weather
-Surface
EXTERNAL FACTORS
-opponent
-Judge
-Audience
-Coach
Personality
Technique/ Coordination
Condition
Tactics
Constitution
PERFORMANCE CAPACITY


Structure of Performance factors
SPORTS PERFORMANCE
Condition
Constitution
Technique / Coordination
Tactics
Personality
Endurance
Strength
Speed
Basic Endurance
General Endurance
Special Endurance
Muscle Composition
Heart & Lung Capillaries
CNS & Psychic
Energy Metabolism reserve

## A typical Sports Psychology Intervention Model

**Annexure 1**

| No of Sessions/ week | Session Plan | Strategies to be used | Objectives of the Plan | Targets to be Achieved | Long Term Goals |
|---|---|---|---|---|---|
| 1st week/ 2-3 session | Assessment of the key areas of focus | Assessing with the psychological tests suggested | Follow up of baseline assessment | Create awareness for the need for Psychological Skills Training program. | To achieve optimum performance.<br><br>To maintain optimum performance. |
| 2nd- 3rd week /2-3 sessions | Intervention for :<br>Reaction time<br>Attention/Concentration | Chronoscope<br>Digit span tasks<br>Cognitive training | To help minimize distractions and enhance attention. | To improve focused sustained, divided and simultaneous attention. | |
| 4th-5th/2-3 sessions | Intervention for :<br>Competition anxiety<br>Arousal monitoring | Relaxation procedures<br>Biofeedback training<br>Cognitive Behaviour therapy<br>Anger management | To optimize arousal and eliminates negative thoughts. | To maintain optimum arousal and increase positive thoughts. | |
| 6th-7th/2-3 sessions | Intervention for :<br>Motivation<br>Mental Fatigue Management | Insight training<br>Motivation enhancement<br>Imagery training | To help build up motivation & regulate fatigue. | To stay motivated and maintain appropriate mental energy. | |
| 8th-9th/2-3 sessions | Intervention for<br>Mental Toughness<br>Communication skills | Assertiveness training<br>Mental toughness procedures | To enhance mental toughness & communication skills | To minimize hindrance & sustain performance. | |
| 10th-12th/ 2-3 sessions | Review of the psychological sessions of the first three weeks.<br>Continuation of the psychological intervention suggested earlier. | Rehearsal<br>Debriefing<br>Generalization | To maintain the intervention gains. | To enhance performance. | |

GTMT or science of training deals with sports performance and training in totality. It is an integrative science. The main function of the GTMT is to gather information pertaining to various aspects of training from the various sports disciplines and science disciplines and formulate generalized guidelines for use in various sports as per the requirement.

Qualified personal having sports background and interaction with other sports science disciplines try to understand the complex nature of sports performance and sports training and assists the coaches and physical educationists in producing better athletes.

The assistance is being provided in the form of information regarding planning and implementation of training during basic and advance training stages for all round development and talent identification, planning and implementation of training for high performers, assessment of performance capacity, analysis and evaluation of training effects and modification in future training plans.

## CONCLUSION

The above discussed branches, as independent branches of sports sciences have occupied a position of importance in these days and research work has started in this direction in order to bring development and improvement in the field of sports. The research in the different areas of these fields has drawn strength from the diversified view points covered by many other disciplines.

To conclude, it can be said that these sciences have become important branches of the field of sports sciences. Sports science is recognized as an independent science all over world and the experts consider Sports Psychology, Kinanthropometry, and Training Methods as very important branches of the sports sciences, like all others.

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