CHAPTER I
A sound mind in a sound body is a principle followed by the common man from time immemorial. During his primitive existence he had to utilize his mental faculty as the efficient way of finding his food mainly by hunting. It is significant to observe that animals also have to use their brain to kill their pray with the least possible physical effort. Horses run through various hurdles like long and wide ditches. They do not have the same speed and stride at every place. They estimate the distance to be covered in the jump and accordingly increase or control their speed. Monkeys jump with different speeds from branch to branch depending on the distance. In short animals use their intellect while undertaking any physical activity.

1) Physical Fitness:

Physical activity needs physical fitness. The President's Council on Physical Fitness and Sports defines it as follows:

"The ability to carry out daily tasks with vigour and alertness without undue fatigue and with ample energy to enjoy leisure time pursuits and to meet unforeseen emergencies, ......

"
Thus physical fitness is the ability to last, to bear-up, to withstand stress and to persevere under difficult circumstances where an unfit person would quit. It is the opposite to becoming fatigued from ordinary efforts. It is lacking energy to enter zestfully into life’s activities and becoming exhausted from unexpected demanding physical exertion.[2]

Physical fitness and Motor fitness are terms which are used interchangeably. Clarke has given the description of three basic components which are involved in physical fitness.

1) **Muscular Strength** is characterised by the contraction power of muscles. This capacity involves the amount of force a muscle can exert.

2) **Muscular Endurance** is characterised by the ability to perform work. This involves performing a task to exhaustion.

3) **Circulatory respiratory Endurance** is characterised by moderate contraction of large muscle groups for long period of time. This capacity is exemplified by running long distances.

Motor fitness includes these three physical fitness components plus four additional factors as follows:

4) **Muscular Power**: This is the ability to release maximum muscular force in the shortest possible time, e.g. putting the shot, one of the field events in athletics and ball-throw test in the present research work.
5) **Agility** : It is the ability to change the body position or direction rapidly e.g. zig-zag-run, shuttle run, squat thrust.

6) **Speed** : It is the capacity of the individual to perform successive movements of the same pattern at a fast rate.

7) **Flexibility** : It is the range of movements in a joint or joints e.g. Sargent jump, popularly known as Jump and Reach.

11) **Not Isolated (Either only as Physical or Mental)**

No physical activity is completely isolated as "only physical" or "only mental".

Collins and Drever (1966) have explained about it, - 'In case of higher organisms at least a simple reflex action rarely takes place in isolation, since the parts of nervous system are all so closely connected together that the stimulation of one receptor may involve the activity of a considerable number of motor neurones i.e. a single sensor-motor are rarely if ever functions alone. Practically the whole nervous system may be affected by stimulation of one receptor'.

In the recent studies of brain damaged subjects; Donal D.N. and Rosenbers say ....... "This loss leaves the brain damaged person unable to organize his perceptions and thinking on the other than concrete phenomenal basis". This finding corroborates Weigh's conclusion that the brain damaged persons is unable
to attend more than a few stimuli concurrently and an inability
to make the required abstract thought may be well hinder his
performance on task which is constructed on a higher level.

Thus in any activity taken up by man his brain and body act
simultaneously.

iii) Ashrama System of Education

The ancient system of education viz. Ashrama System was not
separated as physical and intellectual. They tried to balance
the intellectual activities with the physical ones. Activities
like horse riding, mount climbing, swimming, hunting and fetching
water and collecting samidhas for tending the fire helped to be
physically fit. The students used to live with their Gurus and
experienced, 'life' along with their learning through books only.
They used to have daily exercises like Suryanamaskars, Yogasanas
daily, which ultimately proved to be useful for their health.

every student had to remember that his body may be a product of
physical world ( Prithwi, Aap, Tej, Vayu and Akash Panchafatwa)
but his mind, intellect and soul were created out of spiritual
power. This basic principle of Indian Philosophy was however
discarded in favour of new-one in which the punishment of the
body was considered essential for the development of the soul
(Atma). Ultimately physical education lost its important place
in the educational system.
iv) **Ancient Greece**

In ancient Greece there were a number of people who advocated the progress of physical education for the physical fitness.

Plato did support the harmonious development of both the mind and the body.

The complexity of man's being required that the various elements shall be harmonised. Body and mind - the life of habit and the life of reason ... all must be combined to make a unified whole.

His disciple and the well known thinker of all time Aristotle also favoured physical education. When he pronounced, 'there are three things which make men good and virtuous. These are nature, habit and rational principle. In the first place every one must be born a man. So too one must have a certain character both body and soul ... wherefore habit and rational principle must be in harmony with one another.

The whole Greek culture practised what Plato and Aristotle advocated.

Not only philosophers but psychologists like Sorenson (1954) while discussing about intelligence says - "Children who are bright tend to be above average in other traits also. Rather than being small nervous and sickly they tend to be larger than average, stable emotionally and good in health."
When it is claimed that bright children are always good in health it was thought there was some relationship between physical fitness and intelligence. It was, therefore, decided to find out the affect of physical achievement on intelligence.

Brace has also reported in his studies in Manchester, England, that only 33 per cent of students who were above average, were below average in physique as evidenced by body measurements, but, that 39.7 percent with poor scholarship were below average in physique. Brace has also referred the reports of Christopher, who examined 33,500 school children in St. Louis, found that dull children were generally lighter and a the brighter children were heavier than average children and that intellectual mediocrity was associated with physical mediocrity.

v) Educationists' Views:

One of the important aims of general education is integrated development of the child. Physical fitness is one of the most important and foremost aims of education. It is advised that mere armed chair thinking is not advisable even to an adult and to a boy physical fitness has the same importance as as his mental faculties which must be given proper exercise for his physical development. It is for this reason that John Dewey plans his educational approach through activity, which means the engagement of both mind and body. This would lead to a harmonious development. In the total educational process all elements, physical, mental and spiritual are of equal importance.
vi) Health and Physical Fitness:

In his study about health and school performance Cob has sought to test the central hypothesis that there are health characteristics (or groups of them) that are definitely related to certain aspects (or groups of them) of school performance.

Hopwood and Vandom (1965) have proved positive inter-relationship between health and scholastic achievement.

vii) About Gifted Children:

After studying intellectually gifted children for twenty-five years Terman (1947) has stated that, "the results of the physical measurements and medical examination provide a striking contrast to the popular stereotype child prodigy so commonly predicted as a pathetic creature, overserious, undersized, sickly, hollow chested, nervously tense and bespectacled. There are gifted children who bear some resemblance to this stereotype but the truth is that almost every element in this picture except the last is less characteristic of the gifted child than the mentally average.

Almost two decades after this, Disney Richard (1963) in his research - "A Comparative Study of Mentally Gifted and Average Intelligent High School boy in Physical Education" - compared 50 mentally gifted boys with average intelligence in physical fitness test scores, sports skill test scores and Athletic team participants. He has reported that mentally gifted students scored higher than the students of average intelligence on all the test scores of strength, speed, agility and hand-eye co-ordination.
Mentally retarded children were also studied to find out the relationship between physical fitness and intelligence. Many of these children had some kind of physical deformity - some physical weakness, which was detected by the field workers.

Distefano, Ellis and Sloan (1973) in his doctoral thesis "The relationship between physical fitness and intelligence in trainable mental retardates" has given Stanford Binet intelligence test, and American Association for Health and Physical Education, Youth Fitness test and Fleishman's Basic Fitness Tests to mentally retardates. His findings tend to support the view that physical fitness and intelligence are significantly related.

Other research workers in the field of study of the mentally retarded children like William Clarence (1965), Coefield (1964) and Hermer Lind, Donald (1966) have found the correlations between physical fitness and intelligence, academic achievement, physical and personality measures, physical fitness index and personality measures; Physical Fitness and General learning potential - coefficient of correlation - that is $r$ ranging from 0.35 to 0.896.

Klausmair and Check have studied the relationships among the physical development, mental ability, academic achievements and personality in the children of low, average and high intelligence.
He has concluded that strength grip was the only physical measure among those studied which had significant correlation with intelligence (Coefficient of $R = 0.39$).

x) About Culturally deprived Class:

Joseph J. Gruber has added something new by studying culturally deprived class. Joseph J. Gruber (1970) studied colonial relationships between motor fitness, personality factor and intelligence and intellectual achievements in culturally deprived high school pupils. His findings are as follows:

1) Motor fitness and intellectual achievement $r = 0.52$
2) Co-ordination items & intellectual achievement $r = 0.44$
3) Personality factor & intellectual achievement $r = 0.57$
4) Motor fitness and personality factor $r = 0.52$
5) Co-ordination and personality factor $r = 0.55$

In Kindergarten age some different results have been found out. Fisher D.H. did not find any positive and significant difference in the motor ability and intelligence scores of control and experimental group.

Fine (1973) has already studied the question and remarked - ‘There is a strong, complex relationship between physiological and psychological responses of human beings and their fitness.’

xi) Life is Activity and use of brain and body:

Activity is the expansion and contraction of a muscle or group of muscles. Darwin has said that activity keeps and individual fit
and the context of environment it allows the individual to survive.

This activity if done properly makes him physically fit. In fact nature rejects those who are physically not fit. This is aptly described as the principle of the survival of the fittest. The man has survived up to this age because of his integrated development of brain and body - intelligence and the use of intelligence.

xii) **Perceptual Motor Skills and Intelligence**

Contact of the body comes with an external object, because of the senses, the intellect gives the meaning to that sensation, which is named perception and again the body reacts to external stimuli. Thus there is a relation between the intellect and the body, which normally executes the physical act at various levels.

Frost has rightly pointed out about the perceptual motor skills that all voluntary movement must begin with a perception of the work. Perception consists of selection, organization and interpretation of data received through the senses. During this process the object of the event takes on meaning related to past and is recorded in brain. The process can be presented in the following figure.
There is an infusion of experiences through physical activities to intellectual activities at every stage.

In childhood this intersensory integration is found to be very high. Significant accuracy was found by the ages of 5 to 6 years.

Studies of Piaget and Inhelder 25 (1956) Abravanel 26 (1968) and Zaporazhert 27 (1965) document the developmental progressions of perceptual activity which means of defecting relevant, spatial and figural properties of an object.

Keith F Deary 28 found out positive co-relations among form reproduction scores and those of PMA - Primary Mental Abilities - (they are known as (i) Spatial (ii) Memory, (iii) Perceptual, (iv) Reasoning, (v) Numerical, (vi) Verbal, (vii) Word fluency) subjects and all the abilities together, eye-hand dexterity and chronological age. He suggests that form reproduction was related primarily to M.A. (Mental Age) rather than C.A. (Chronological Age)
He found co-relation ranged from 0.38 to 0.75 between Mental Age and reproduction of the Form in grade First, Fourth and Sixth.

It means one goes on learning from motor activities to perception and from perception to abstract thinking. So there must be some relation between physical fitness and intelligence.

xiii) **Perception, Motor skills and School Achievements**:

Judith Greenbery and Leonard Alshan 29 have remarked - "Performance in school achievement was high enough of those who had better perceptual motor functioning in the lower classes".

**Psycho-motor Domain and Physical Education**.

Physical Education has a very big share in shaping the personality of a boy. In the development of personality one has to gather a number of experiences. The book of life has a number of pages. Greater the number of pages richer the book. This experience has three main phases - domains - Cognitive Domain, Affective Domain and Psychomotor Domain.

ivx) **Psycho-motor Domain**:

The Psycho-motor domain has specific Taxonomy, which is explained by the following basic elements:

1) **Reflex movements**:

These are the most natural movements for the protection of a living organism in its natural environment (e.g., reaction by the eye-lids to the blowing wind or dazzling light).
2) **Basic Fundamental Movements**:  
These are developed with natural growth, e.g. The child's crawling, sitting, walking with some support and then walking without support. These simple movements develop gradually with big muscle activities.

3) **Perceptual Abilities**:  
This implies the use of senses in relation with the meaning of past experiences e.g. knowing from particular to general and general to particular.

4) **Physical Abilities**:  
These need the development of heart, lung capacity, upper and lower extremities, big muscles and many joints to move, for smooth and easy movements.

5) **Skilled Movements**:  
These imply ease in complicated reflexes, sequence in movements, collective movements, elimination of unwanted movement, neuro-muscular and brain-muscular co-ordination at higher level muscular activities and maximum output within minimum efforts and that too with certain grace and touch of individuality.

6) **Non discursive Communication**:  
It is speech which sticks to main principles only in order to understand the main principle it avoids rambles here and there. This requires thinking.
These six phases are again divided into different sub-elements for the sake of study. Important among these are (1) Perceptual abilities, involving kinesthetic discrimination, visual discrimination, auditory discrimination, tactile discrimination, and co-ordinated abilities. The physical abilities include endurance, strength, flexibility, agility and speed etc.

Reflexes are developed as a need of the nature, in order to avoid the labour and save time and energy of an individual. These reflexes are needed to form higher and complex reflexes. Perceptual abilities are useful in various games, sports and other physical education activities. Visual, kinesthetic discrimination and co-ordinated abilities are highly useful for skilled gymnastic and other movements. Of course, the development of only perceptual abilities is not enough. Certain minimum physical abilities such as speed endurance, strength, flexibility, agility are also required. Basic fundamental movements with perceptual abilities and physical abilities would develop the skilled movements in certain activities e.g. hand spring, cat vault and other jumps on vaulting horse, floor exercise like cart-wheel and hand balance need specific balance, strength and kinesthetic sense. In the games like Basketball judgement visual and kinesthetic sense is absolutely necessary while scoring the basket. After practising any activity with these five elements (Reflex movements, Basic fundamental movements, perceptual abilities physical abilities and skilled movements) one develops non-discursive communication.
that is he sticks to certain skills, certain principles which are derived by his own experiences. He has his own pattern of behaviour evolved out of the experiences based on the main elements of psychomotor development. There is a combined inseparable effect of all these basic principles on his total action. A good cricket captain knows the capacities, skills, temperament etc. of his team-mates and also the batsman from the opposite side. He gives proper instructions to the bowler and arranges his field accordingly, anticipating the total result of all his plan.

xv) Harmonious Development:

Thus development of psycho-motor skills is possible when many of the factors on which they depend are given enough facilities for proper development under ideal conditions, three aspects of any experience (cognitive, affective and psychomotor) are integrated. So for the harmonious development of the personality of an individual, physical, intellectual, emotional, cultural and social developments are part and parcel of the total educational programme.

There is no doubt that physical fitness is essential for a man. Darwin has aptly stressed its importance. The word fitness suggests the ability of a person to work or to play with maximum physical efficiency and to be prepared to meet a danger or distraction which is unforeseen. In the modern age, mental, emotional and intellectual fitness is required along with physical fitness.

Relationship between physical fitness and personality traits have been studied by many.
Kinneth, Tillman 30 (1965) Betszand Robert 31 (1953) and Wells 32 H.P. have studied the relationship between the physical fitness and personality traits. They found significant difference in personality make-up in persons who are physically fit as against those who are physically weak. Van Huss 33 Wayne have proved that persons who have the ability to remove the tension on their circulatory and respiratory system have a better emotional balance. Wright and Beathrise 34 have also insisted that physical fitness is essential for mental hygiene and mental peace.

Rogers 35 has observed "physically unfit boys and girls at all levels of intelligence have greater difficulty in continuing mental effort and remaining mentally alert. The potential for learning depends upon both intelligence, physical fitness.

The qualities that contribute to the ability of an individual to perform complex mental task under various circumstances are of great interest to educationists, parents and students. Physical fitness may play a part in helping an individual to realize his intellectual potentialities. With a low physical fitness he would have a great difficulty in performing tasks which require complex mental efforts.

In this context Cowels 36 is of opinion that normal fatigue causes the logical process to work more slowly and less efficiently. Ash 37 also stresses that the main characteristic of excessive fatigue is loss of control in mental function.

Thus it appears that physical emotion can affect the ability of an individual to perform a complex mental task.
An explanation of this phenomenon as given by Bill makes it clear that mental fatigue relates to low oxygen supply in higher nerve-centres.

Bernard Gutin - a physical educator of long experience has also rightly pointed out that there is some effect of exercise on mental abilities. It means that field workers in physical education have accepted that there is a relationship between intellectual and physical abilities.

xvi) Effect of Exercise:

Bernard Gutin has further pointed out "poor exercise seems to be curvilinearly related to intellectual performance with optimal performance following light exercise that raises the heart rate to about 90 - 120 b.p.m. He adds Exercise Induced Activation (EIA) has greater effect on many organs and systems of the body the term level of activation described the degree of metabolic activity in the tissues of the organism ... of course this level of activation differs from person to person and task to task.

Some workers have studied the effect of exertion on the perceptual motor and intellectual activities. Such a research requires professional medical assistance.

Heb has pointed out that there are certain factors do change after exercise. For example "Exercise increases temperature, nerve-conduction velocity, cardio respiratory and skeletal structure."
It increases neural noise to react to that particular stimulus. Simonson has worked on the effect of light and strenuous exercise. He says "Flicker Fusion Frequency, which is considered a measure of the flexibility of visual and central nervous system has been found to be increased following the light exercises and to be exhausted following strenuous exercise.

xvii) Topic of the Research:

It is the aim of this research to find out the effect of physical fitness in terms of physical achievement on intelligence in the boys in the age groups from 13 to 16 years. So the title of the research is:

"EFFECT OF PHYSICAL ACHIEVEMENT ON INTELLIGENCE"

The concept of integrated development has been stressed by many eminent educationists. However, the studies already conducted in this direction by many research workers in Europe and America are in the direction of relationships, thereby obtaining the results in the different directions.

The boys who high scores in various physical achievement and low scores in physical achievement are being compared with respect to their achievement in intelligence test. For testing physical fitness tests which test strength, power, agility and flexibility are given. For testing intelligence Dr. A.W. Oak's intelligence test is used.
SUMMARY:

The body is the basic means to perform daily duties. Animals have to keep this machine fit and working as this is the only means, by which they can win their daily bread and survive in the keen competition for livelihood. Though man is the highest developed animal he cannot afford to neglect physical fitness, which implies strength, power, endurance, agility, speed, flexibility and a few other important factors. But the master of the body is mind. Various research workers in Europe and America have shown positive relationship between the mind and the body, intelligence and physical fitness.

No human activity is performed in isolation, be it the activity of mind or the body. In ancient Indian Educational System - the Ashram School as also in the Greek Education System, close attention was paid to physical fitness along with the development of the mind.

Psychologists like Sorenson and Educationists like John Dewey have accepted the body-mind relation and have used the said relation for integrated development of the child. Many field workers who have studied mentally gifted, mentally retarded, mentally or culturally deprived and intellectually average class of students have accepted that there is a relationship between physical fitness and intelligence.
Perceptual motor skills and intelligence and perceptual motor skills and physical fitness are correlated. Perceptual motor skills and school achievements are also related, which has been accepted by many field workers.

The development of personality has three domains cognitive, affective and psychomotor. Physical education lays stress on education through physical activities. Hence the psychomotor domain has been briefly explained.

In this research work it is proposed to test the physical fitness of the boys from 13 to 16 years. The intelligence is being tested with the accepted test for Intelligence Quotient, developed by Dr. J.N. Oak.

In the next Chapter II study of the related literature has been presented.
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